User's Manual
TK-78K0/KF2+Voice

Date published: June 2008
Rev. 1.1
© TESSERA TECHNOLOGY INC. 2008
Printed in Japan

Windows and Windows XP are registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

- The information is subject to change without notice.
- No part of this document may be copied or reproduced in any form or by any means without prior written consent of TESSERA TECHNOLOGY INC.. TESSERA TECHNOLOGY INC. assumes no responsibility for any errors that may appear in this document.
- TESSERA TECHNOLOGY INC. does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of TESSERA TECHNOLOGY INC. products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of TESSERA TECHNOLOGY INC. or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of a customer's equipment shall be done under the full responsibility of the customer. TESSERA TECHNOLOGY INC. assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.

CAUTION

- Do not give any physical damage to this equipment such as dropping
- Do not superimpose voltage to this equipment.
- Do not use this equipment with the temperature below 0℃ or over 40℃.
- Make sure the USB cables are properly connected.
- Do not bend or stretch the USB cables.
- Keep this equipment away from water.
- Take extra care to electric shock.
- This equipment should be handled like a CMOS semiconductor device. The user must take all precautions to avoid build-up of static electricity while working with this equipment.
- All test and measurement tool including the workbench must be grounded.
- The user/operator must be grounded using the wrist strap.
- The connectors and/or device pins should not be touched with bare hands.

Contents

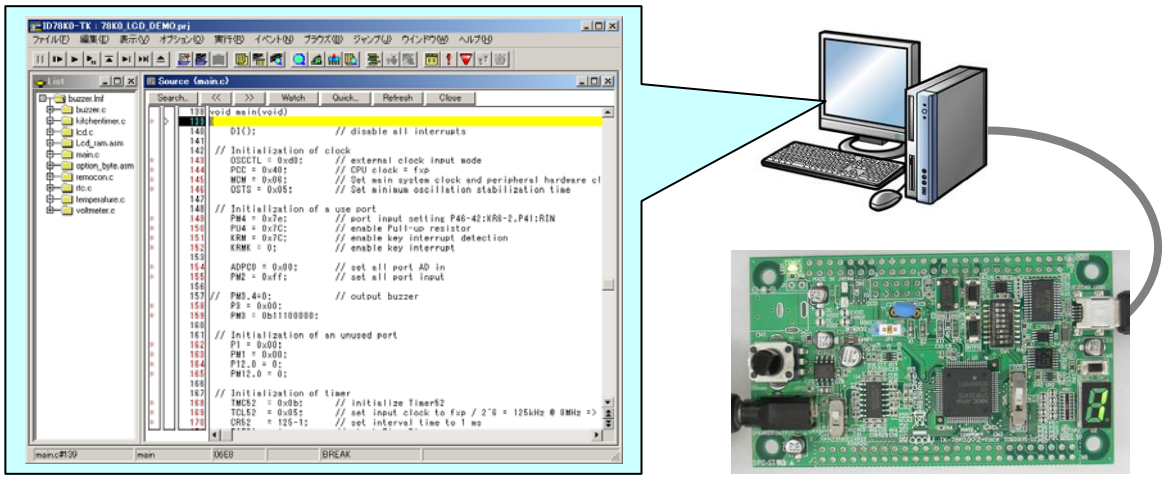
CHAPTER 1 PREPARATION 7
1.1 Development Tools / Software 8
1.2 Installation of Development Tools 9
1.2.1 Installation Package 9
1.2.2 Installation of Development Tools 9
1.3 Installation of USB Driver 15
1.3.1 Installation on Windows XP 15
1.3.2 Installation on Windows 2000 19
1.3.3 Completion of USB Driver Installation 24
1.4 Sample Programs 25
1.4.1 Preparation of Sample Programs 25
1.4.2 Overview of Sample Programs 28
CHAPTER 2 EXPERIENCES 29
2.1 Start PM Plus 31
2.2 What is PM Plus 32
2.3 Load Workspace (project) 34
2.4 Set Linker Options 36
2.4.1 "Output1" Tab 36
2.5 Set Compiler Options 38
2.5.1 "Preprocessor" tab 38
2.5.2 "Extend" Tab 39
2.6 Create Load Module Files 40
2.7 Check Debugger Settings 42
2.8 Check Board Settings 44
2.9 Start Debugger (ID78K0-TK) 45
2.10 Run Programs 48
2.11 Stop Programs 50
2.12 Close Debugger (ID78K0-TK) 51
2.13 Quit PM Plus 52
CHAPTER 3 HARDWARE SPECIFICATIONS 53
3.1 Layout of hardware functions 54
3.2 Layout of solder-short pad and test pad 54
3.3 Hardware Functions 55
3.3.1 SW1, SW5 55
3.3.2 SW2 (INTP1) 57
3.3.3 SW3 (INTP1) 57
3.3.4 SW4 (Filter) 57
3.3.5 SW6 (RESET SW) 58

3.3.6 JP1 58
3.3.7 COD1 58
3.3.8 U2(7seg LED) 59
3.3.9 LED1 (POWER) 59
3.3.10 CN1, CN2 60
3.3.11 CN3 60
3.3.12 CN4 60
3.4 Solder short pad 61
3.5 CN1, CN2 terminal list 62
3.6 Dimension of the board 66
CHAPTER 4 SAMPLE PROGRAMS 67
4.1 Sample Program 1 Structure 67
4.2 Sample Program 2 Structure 68
4.2.1 Run Sample Programs 74
4.2.2 Sound Play Function 74
4.2.3 Sound Data Download Function 75
CHAPTER 5 TROUBLESHOOTING 77
5.1 If you cannot find USB driver when you connect PC to the kit 77
5.2 Error when you start the debugger 77
5.2.1 "Can not communicate with Emulator..." (F01b0) 78
5.2.2 「No response form the CPU ・・・」(A01a0) or no response from ID78K0-TK 78
5.2.3 "Incorrect ID Code." (Ff603) 79
5.2.4 "The on-chip debug function had been disabled in the device." (F0c79) 79
5.2.5 When the flash memory erasing is not well with PG-FPL3 79
CHAPTER 6 OTHER INFORMATION 80
6.1 Create a new workspace 81
6.2 Register additional source file 85
6.3 Debugger tips 87
6.3.1 Display source list and function list 87
6.3.2 Set/delete breakpoints 88
6.3.3 Display global variables 89
6.3.4 Display local variables 90
6.3.5 Display memory and SFR contents 90
6.3.6 Erase microcontroller built-in flash memory 91
6.4 Circuit diagram 95

Introduction

TK-78K0/KF2+Voice is the evaluation kit for development with sound systems using "78K0/Kx2", NEC Electronics 8bit all flash microcontroller.
The user only needs to install the development tools and USB driver, and connect the host machine with the target board to start the code development, build, monitoring the output, and debugging code.
(This demonstration kit uses the on-chip debug feature from the microcontroller itself, without emulator connection)

Configuration for Debugging



As the sample programs are preloaded, you can play the sound immediately by connecting a speaker.

Operations:

1. Set JP1 to 1-2 short
2. Set SW1 as shown in the right table (All OFF)
3. Connect a speaker to CN4
4. Supply power by connecting USB1 to PC with USB cable.
5. Operate switches.
   - ・SW3 Play / stop
   - ・SW2 Select play data
   - ・V1 Volume control

SW1 Settings							
1	2	3	4	5	6	7	8
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

NOTE

When the USB power supply has noise, the output sound data will have noise as well.

Overview This manual consists of the following contents.

Read chapter 1 and 2 first for installing the development tools and using the sample programs.

Read chapter 3 for customizing the sample programs and the hardware.

Chapter 1: Preparations
Install the development tools

Chapter 2: Experiences
Experience the basic operations of integrated development environment (PM Plus) and integrated debugger (ID78K0-TK) with using sample programs.

Chapter 3: Hardware Specifications
Explain the hardware of TK-78K0/KF2+Voice

Chapter 4: Sample Programs
Explain functions used in sample programs

Chapter 5: Troubleshooting
Describe how to solve troubles you may face, such as errors when starting the integrated debugger (ID78K0-TK)

Chapter 6: Other Information
Introduce other information, such as how to create a new workspace (project) on integrated development environment (PM Plus), how to register additional source file, and some useful tips of the integrated debugger.
The circuit diagrams of demonstration kit are included in this chapter.

Reader This manual is intended for development engineers who wish to become familiar with the development tools for the 78K0.
It is assumed that the readers have been familiar with basics of microcontrollers, C and Assembler languages, and the Windows™ operating system.

Purpose This manual is intended to give users an understanding of the features, hardware configurations, development tools for the 78K0.

CHAPTER 1　Preparation

This chapter describes following topics:

- Overview and installation of development tools
- Installation of development tools
- Overview and preparation of sample programs

Users can experience the development flow such as coding, build, debugging, and test, by using the development tools bundled with TK-78K0/KF2+Voice.

1.1 Development Tools / Software

- Device file DF780547 V2.20

  A device file contains device specific information. So, users need a device file to use the development tools.

- Integrated Development Environment (IDE) PM plus V5.21

  The IDE works on Windows operation system.
  Users can develop a system efficiently by using the editor with idea processor function, compiler, and debugger.

- C Compiler CC78K0　W3.70 (code size limited version)

  C compiler for the 78K0 microcontrollers. The object code size is limited to 32 Kbyte.
  This compiles C code for 78K0 and ANSI-C code program into assembler code.
  This produces object code and linker.

- Assembler RA78K0　W3.80 （code size limited version）

  Assembler for the 78K0 microcontrollers. The object code size is limited to 32 Kbyte.
  This convert the assembler code for 78K0 into object program. The object program will be used for debugger.

- 78K0 Integrated Debugger ID78K0-TK V2.02

  This is the tool for debugging the object program generated by C compiler and assembler. The debugger enables to do C source level debugging. With the debugger, you can debug the code easily and efficiently by refering and changing variables, using step-in debuging function, and so on.

- Built-in Flash Memory Writing Program PG-FPL3

  This is the Windows software to write programs on built-in flash memory.
  By connecting TK-78K0/KF2 and PC with bundled USB cable, you can write/delete programs on the built-in flash memory.

- Sample program 1, 2 / ADPCM-SP2 Decompress Library

  Sound play program that uses the decompress library

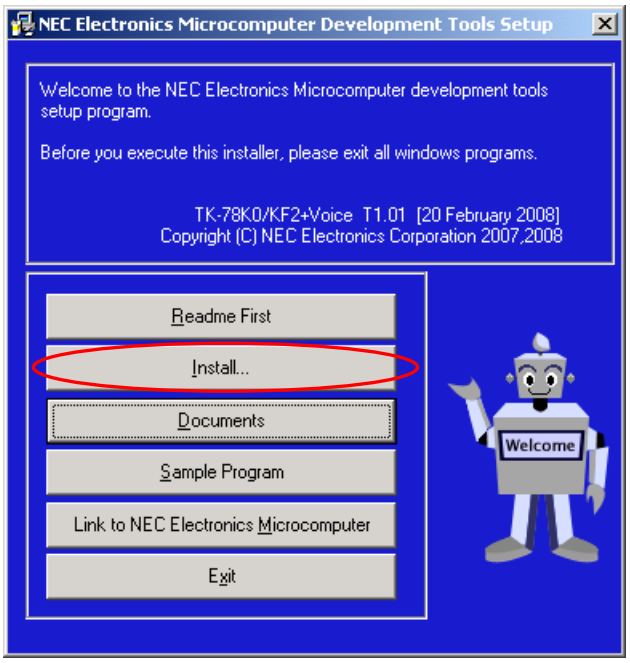
1.2 Installation of Development Tools

1.2.1 Installation Package

The attached CD-ROM includes the development tools and documentations. Users can use the installer to install those development tools and documentations.

1.2.2 Installation of Development Tools

① Please insert the CD-ROM in the drive. The installer will show up automatically. If it does not start automatically, please initiate it by double clicking the SETUP.EXE.



<1> Readme First

The contents of the CD-ROM, and some notes are available.

Please read it at first.

<2> Install…

Click "Install" to start installation of development tools.

For details, please refer to the next section.

<3> Documents

Manuals of development tools and the evaluation kit are available in PDF files.

When this button is clicked, the WWW browser will start. Adobe® Acrobat® Reader is available in the CD-ROM.

<4> Sample Program

Click this button to start the WWW browser for the sample program and the tutorial.

<5> Link to NEC Electronics Microcontrollers

Click this button to start the WWW browser display the link to the NEC Electronics Microcontroller web site (http://www.necel.com/micro/index_e.html)

The NEC Electronics Microcontroller web page provides with the latest product/tool information and FAQs.

<6> Exit

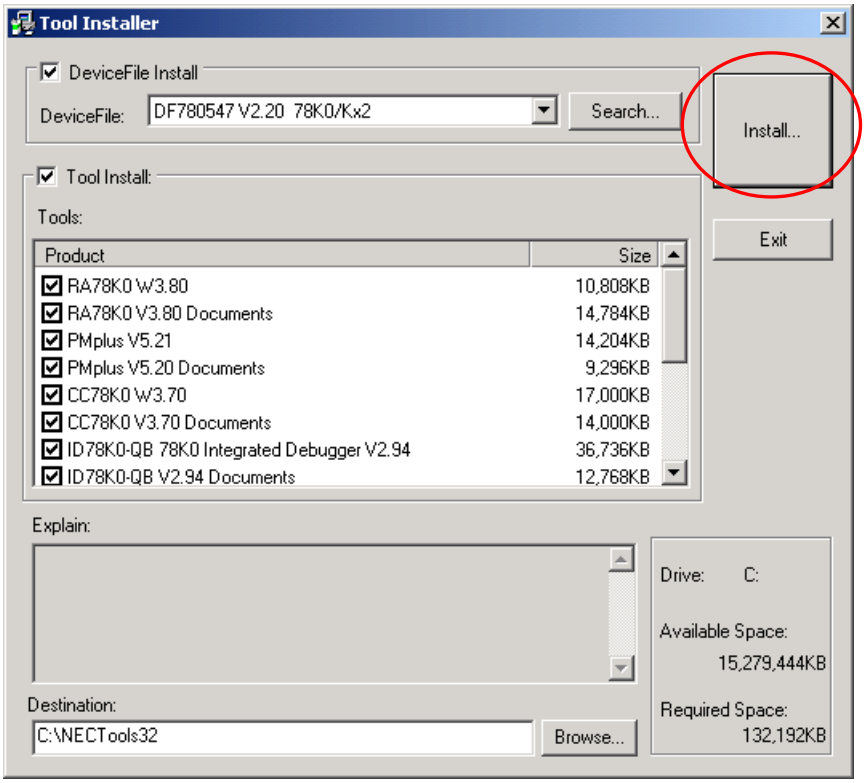
Terminate the setup.

② Click the "Install"

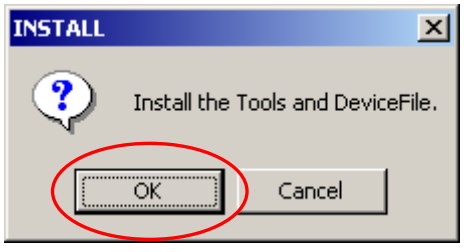
③ "Tool Installer" dialog box is opened.
Select products that you need to install.
(as default, all the products that you need to use the TK-78K0/KF2+Voice are selected.)
"Explain" area displays an explanation of the selected product.
To change the installation destination, click Browse··· .

When all the settings are completed, click Install··· .

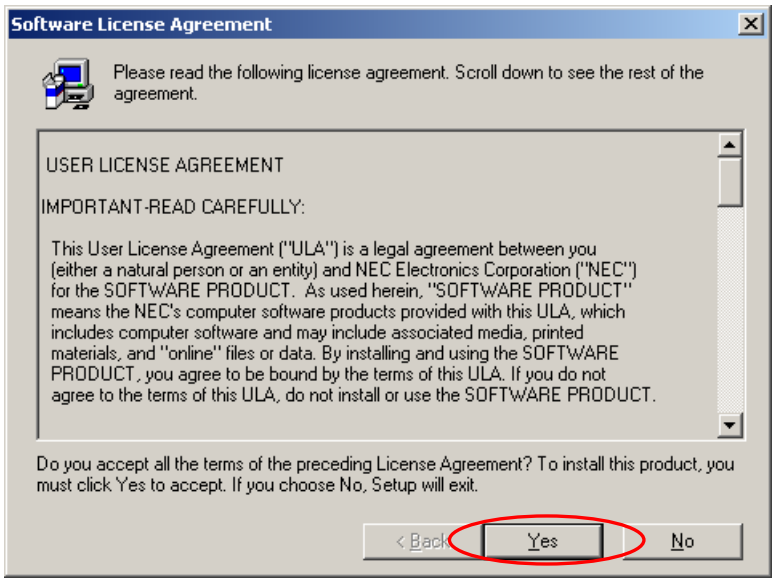
* In this document, it is assumed that users install the programs under "NECTools32" directory (default installation directory). Users can find the tools by selecting "Start Menu" -> "Programs" -> "NEC Tools 32".



④ Click OK when "Install" comfirmation dialog box is opened.

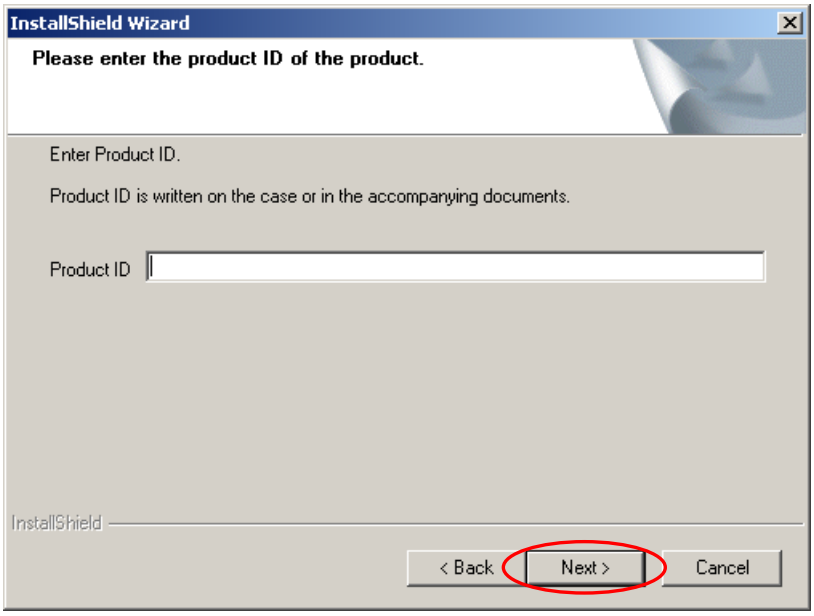


⑤ Read "software license agreement" and click [Yes] for continuing the installation.
To stop the installation, click [No] .



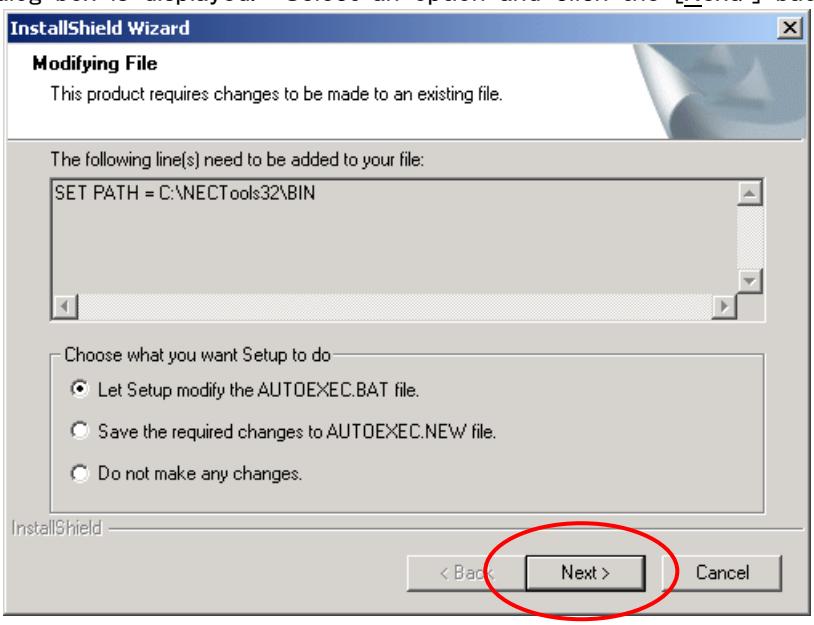
⑥ Enter the product ID, and click [Next] .

＊ The product ID is available on the other sheet.

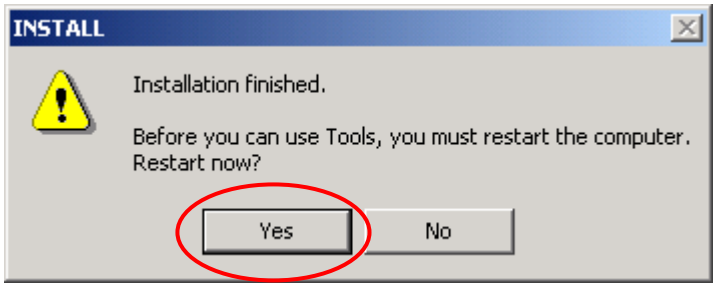


⑦ It starts copying the files.

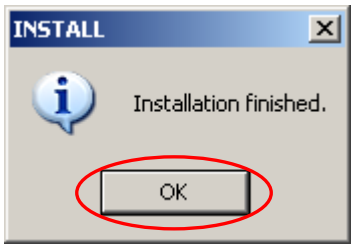
⑧ When the files have been completely copied and if AUTOEXEC.BAT must be corrected, the following dialog box is displayed. Select an option and click the [Next>] button.



⑨ If it is necessary to restart the computer, the following dialog box is displayed. Click [Yes] to restart the computer.



⑩ When the installation is completed, the following dialog opens.
Click OK .



⑪ "USB Serial Converter" USB driver must be installed on PC before you use TK-78K0/KF2+Voice.

Install the USB driver by referring "1.3 Installation of USB Driver".

Notes on the installation authority

To install this tool in Windows 2000 or XP, the authority of an administrator is necessary. Therefore, please login as an administrator.

Notes on the install-directory

Please do not use 2-byte characters, such as umlaut in the directory name, where the product is to be installed.

Note on the version of Windows

If the language of the Windows is not English, a file transfer error during installation might be observed. In this case, please abort the installation in the language, and re-install it in an English version of Windows.

The identical problem may be observed, if a language other than English is specified as the system language in the "Regional Settings Properties" tab.

Limitation

Assembler RA78K0 and C compiler CC78K0 limit the object size to 32 Kbyte.

1.3 Installation of USB Driver

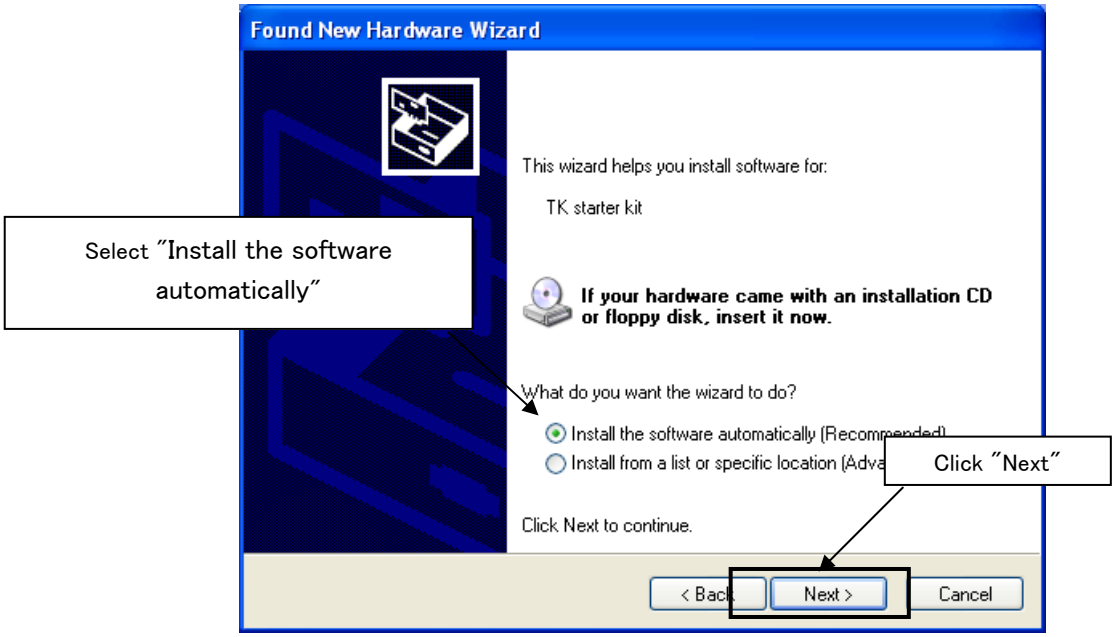
When TK-78K0 is used, it is necessary to install "USB Serial Converter" and the " USB Serial Port" driver in the host machine. Please install the driver according to the following procedures with appending CD in the drive.

Attention Please do not connect TK-78K0 by way of the USB hub. It is likely not to operate normally.

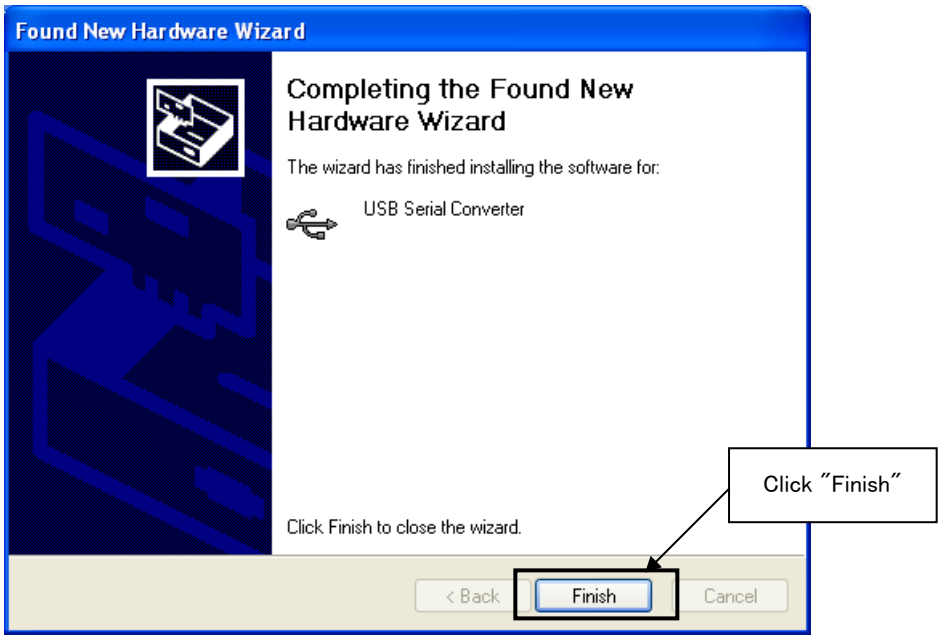
1.3.1 Installation on Windows XP

① Once the TK-78K0/KF2+Voice is connected with USB, the "Found New Hardware Wizard" will be started.
Select "No, not this time" and click Next > .

② Select "Install the software automatically" and click Next > .

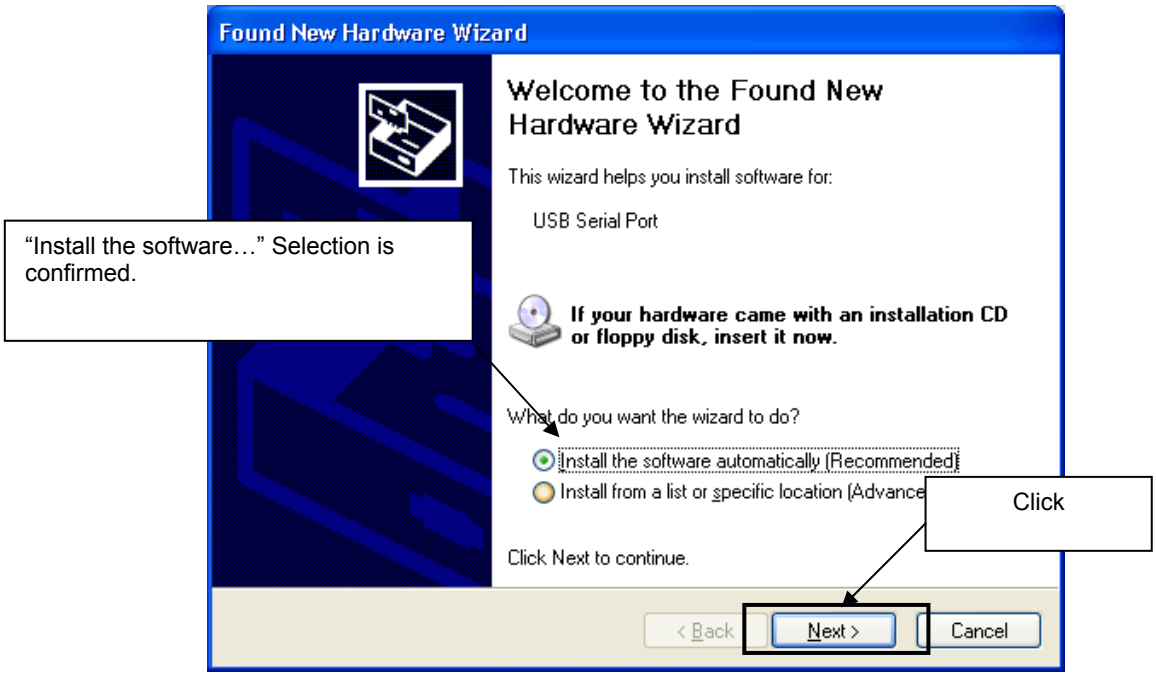


③ The installation of "USB Serial Converter" driver is completed.
Click Finish .



④ The "USB Serial Port" driver's installation begins continuously. Select "No, not this time" and click Next > .

⑤ Select "Install the software automatically" and click Next > .



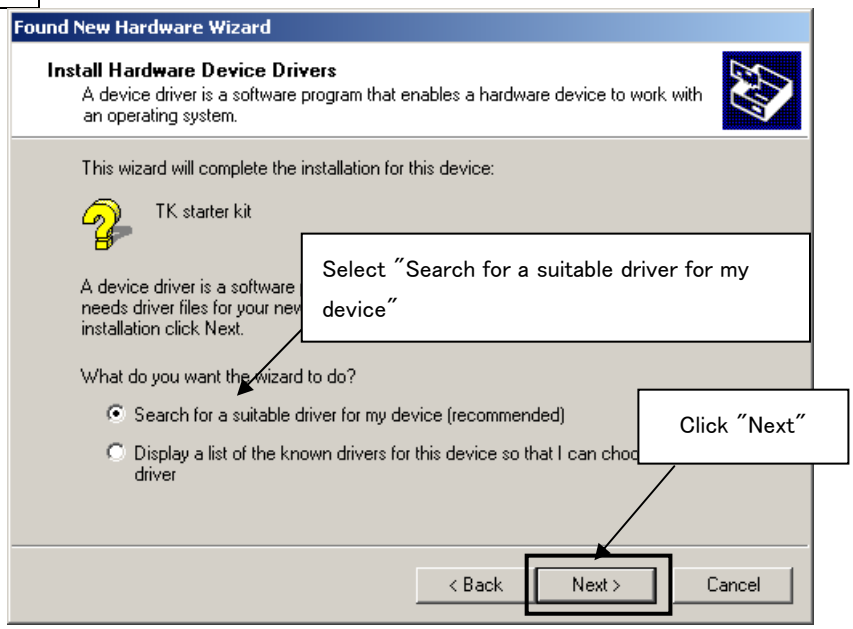
⑥ The installation of "USB Serial Port" driver is completed.
Click Finish .

⑦ Driver Installation has been finished.

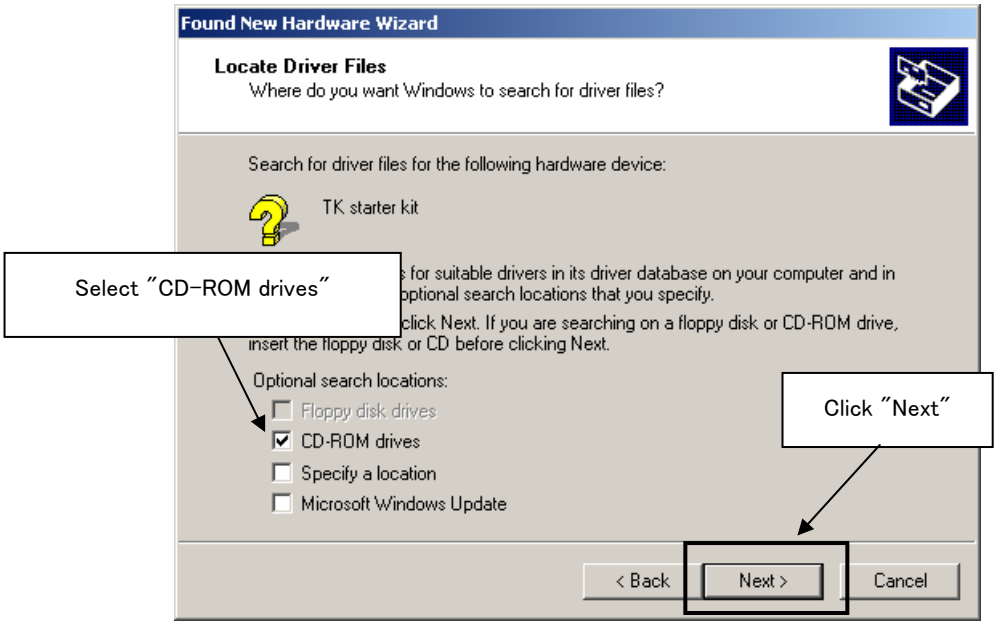
1.3.2 Installation on Windows 2000

① Once the TK-78K0/KF2+Voice is connected with USB, the "Found New Hardware Wizard" will be started.
Click [Next >] .

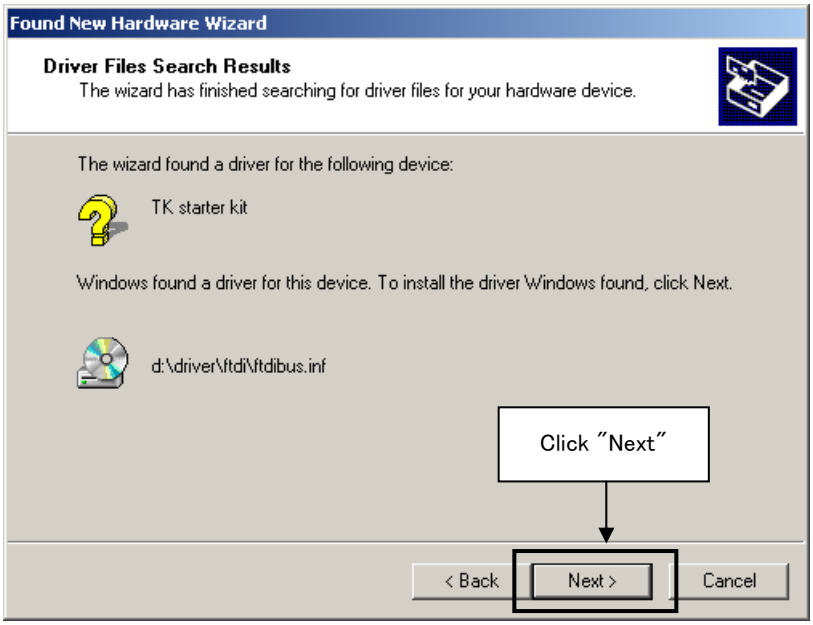
② Select "Search for a suitable driver for my device".
Click [Next >] .



③ Select "CD-ROM drives".
Click Next > .



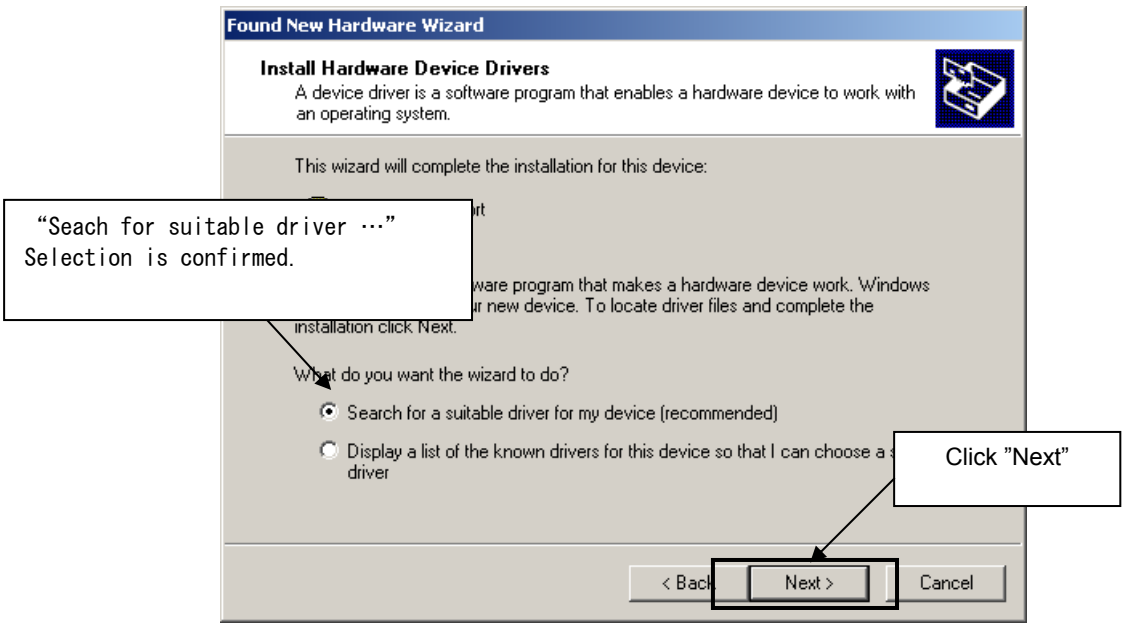
④ Click Next > .



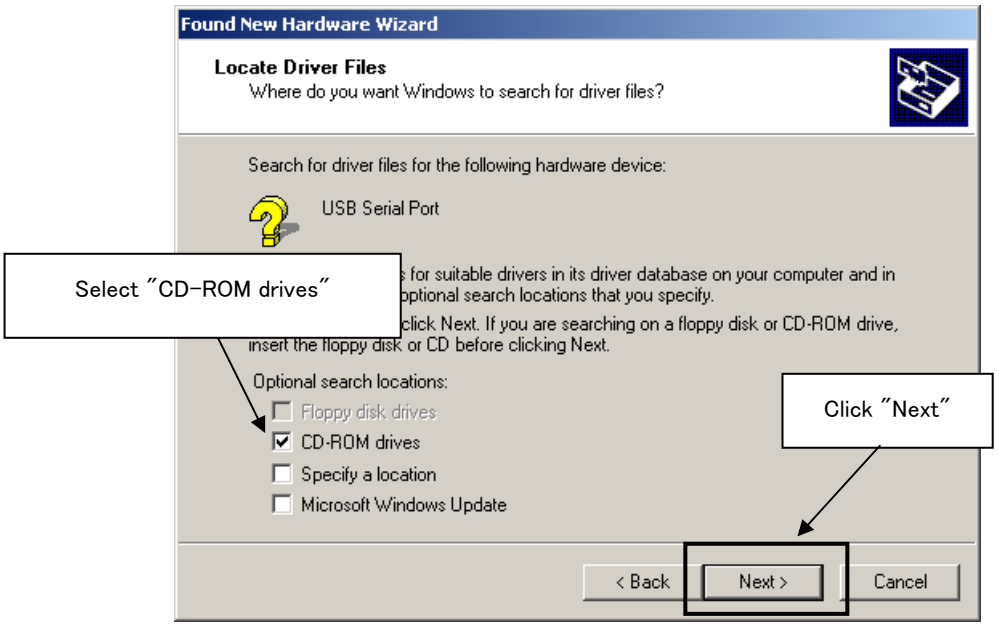
⑤ The installation of "USB Serial converter" driver is completed.
Click Finish .

⑥ Once the TK-78K0/KF2+Voice is connected with USB, the "Found New Hardware Wizard" will be started. Click Next > .

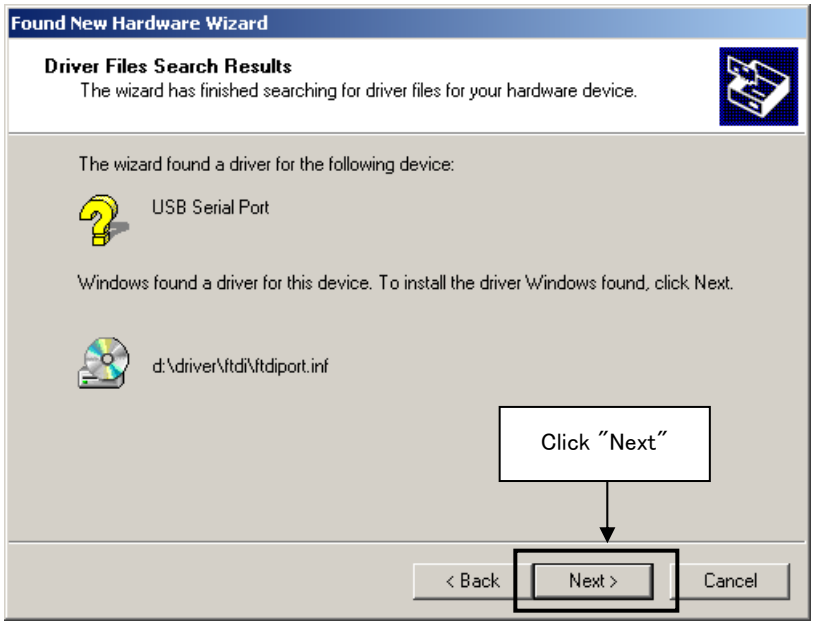
⑦ Select "Seach for suitable driver …" and click Next > .



⑧ Select "CD-ROM drives".
Click Next > .



⑨ Click [Next >] .



⑩ The installation of "USB Serial converter" driver is completed.
Click [Finish] .

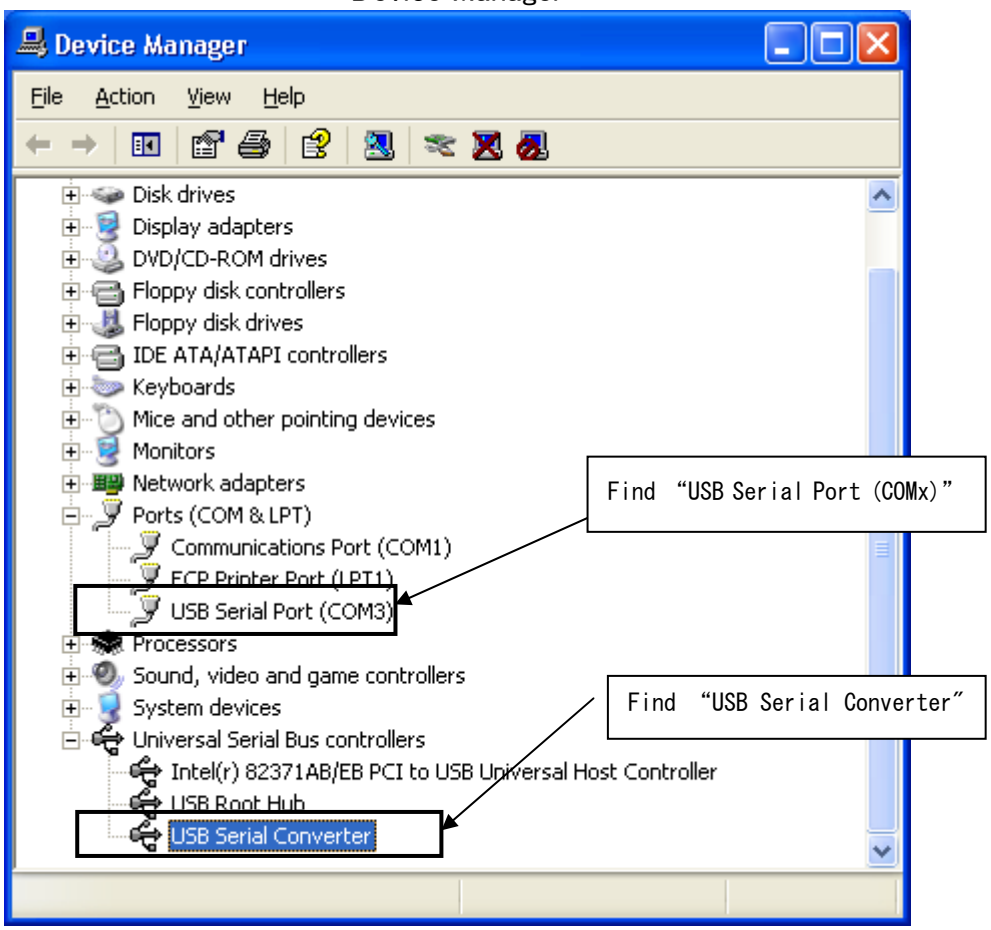
⑪ Driver Installation has been finished.

1.3.3 Completion of USB Driver Installation

Confirm the two USB drivers are installed on PC.

Start "Device Manager", and find "USB Serial Converter"(without "?" mark) under the "Universal Serial Bus controllers" and "USB Serial Port (COMx)" (without "?" mark) under the "Ports (COM & LPT)" .

Device Manager



The screen above shows that the COM port number is "COM3". Run "Portconfig for ID78K0-TK" to set the port number for ID78K0-TK to COM5 after installing the software.
If ID78K0-TK is not in use, you can use this port number for connecting TK-78K0/KF2+Voice.
When you change the USB port connection, the COM port number will be changed as well.

CAUTION

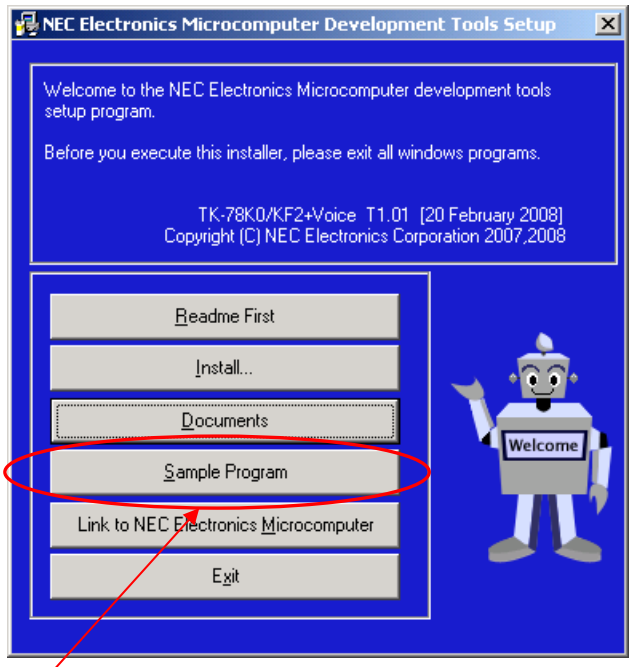
・Do not do "Hardware Modification Scan" when you communicate with the target device.

1.4 Sample Programs

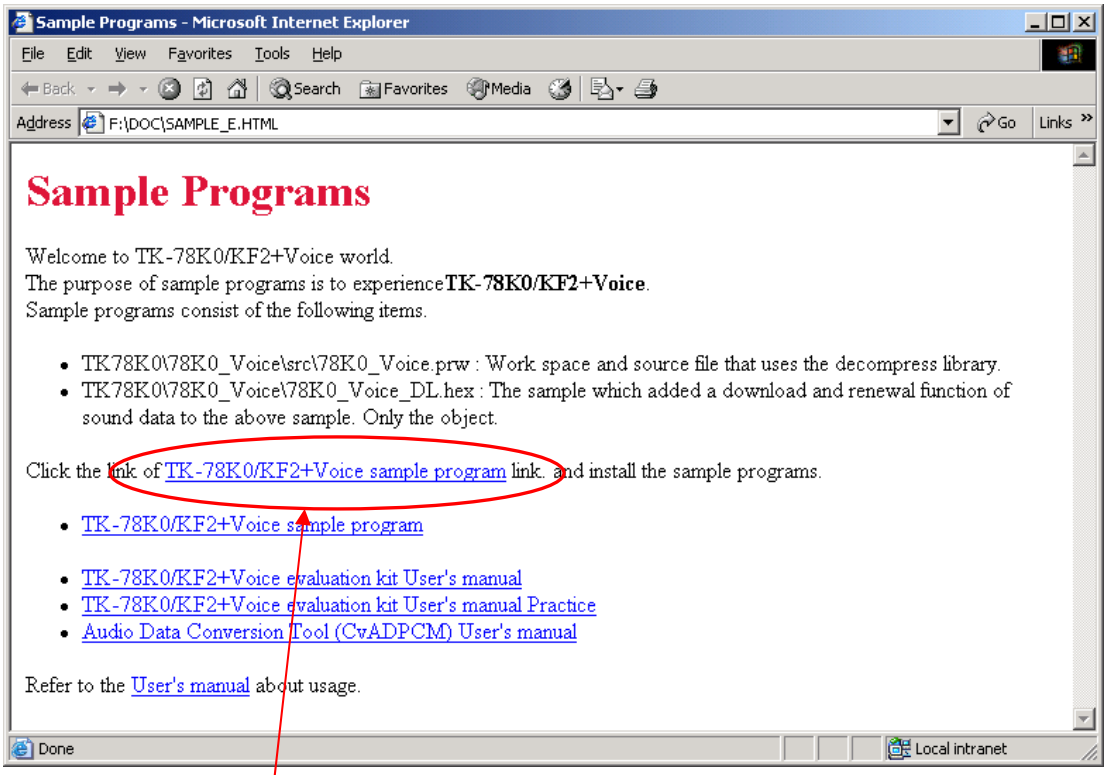
This section explains the overview and preparation of sample programs.
For details about the sample programs, see "4. Sample Programs".

1.4.1 Preparation of Sample Programs

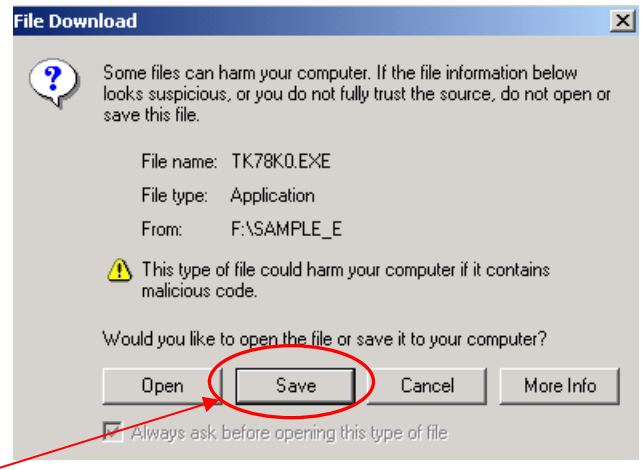
① Insert the CD-ROM disk in the CD-ROM drive of your PC. The [NEC Electronics Microprocessor Development Tools Setup] screen automatically appears.(if this screen does not appear automatically, start setup.exe from Explorer. etc.)



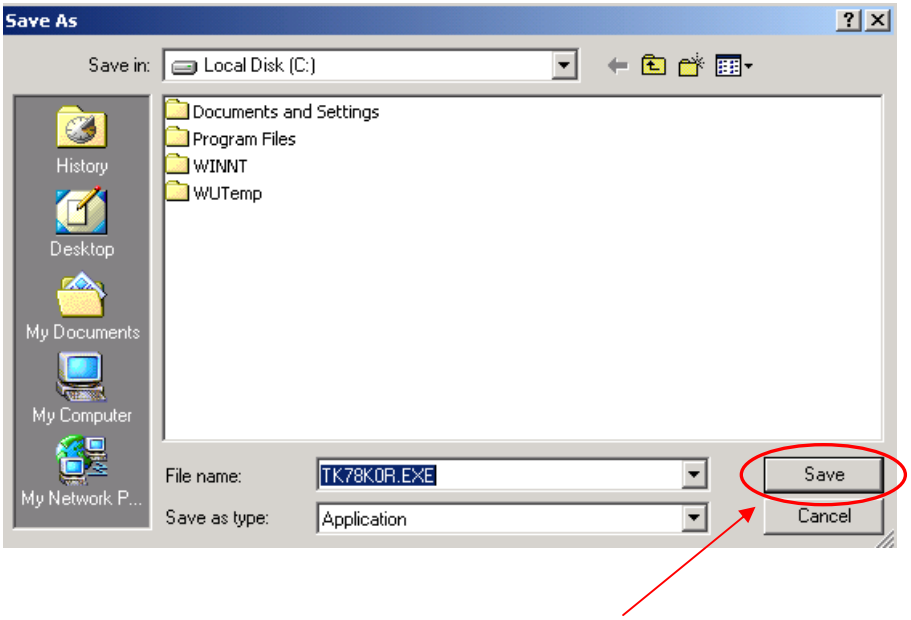
② Press the Sample Program button to start the WWW browser.



③ Click the "TK-78K0/KF2+Voice Sample Programs" link , the following download confimation window appears.



④ Click the Save butten.

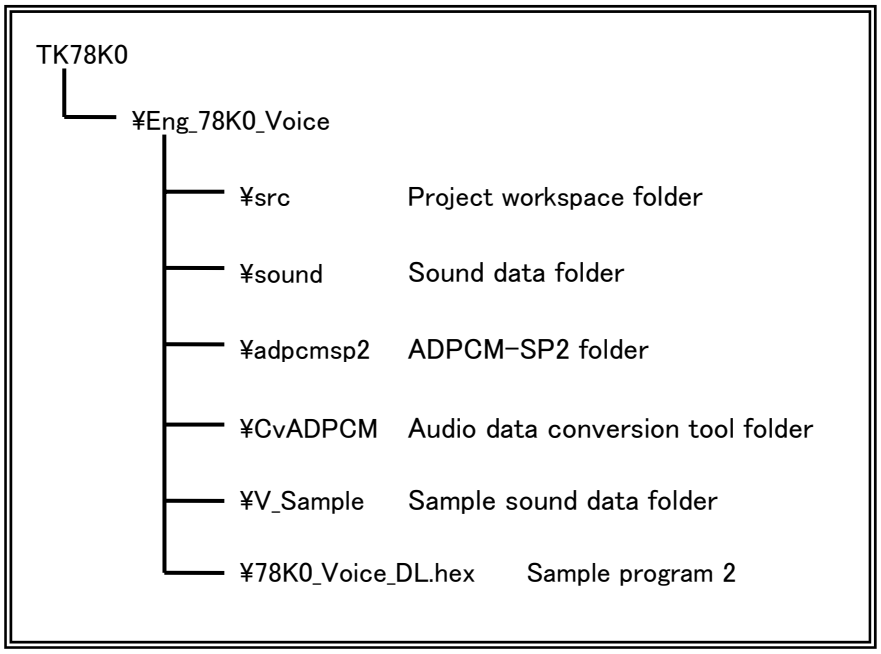


⑤ After specifying the download destination folder, click the Save button.

⑥ The self-extraction sample program set (TK78K0.exe) is copied to the specified folder.
The folder that the "TK78K0" folder is made when this file is executed, and the sample program is stored under the folder in addition is made.

1.4.2 Overview of Sample Programs

The sample programs consist of following directories.



CHAPTER 2　Experiences

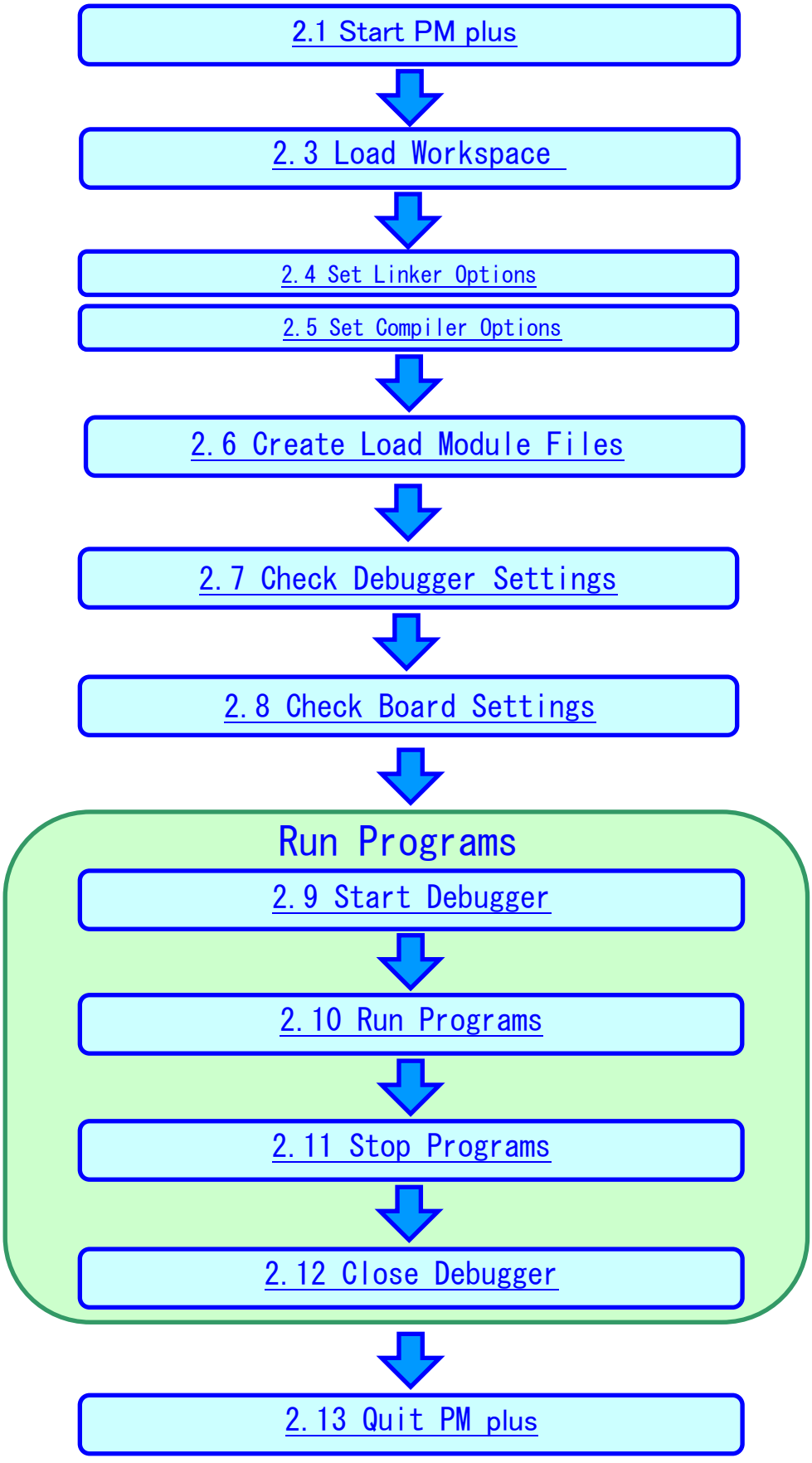
In this chapter, you will experience how to use the development tools with using the sample programs. The development tools are :

- Integrated Development Environment (IDE), PM Plus
- Integrated Debugger, ID78K0-TK

You will use the programs that you prepared in "1.4 Sample Programs", as the sample programs for TK-78K0/KF2+Voice.

You will be able to understand how to use the development tools and the concept of project files which you need for producing application programs.

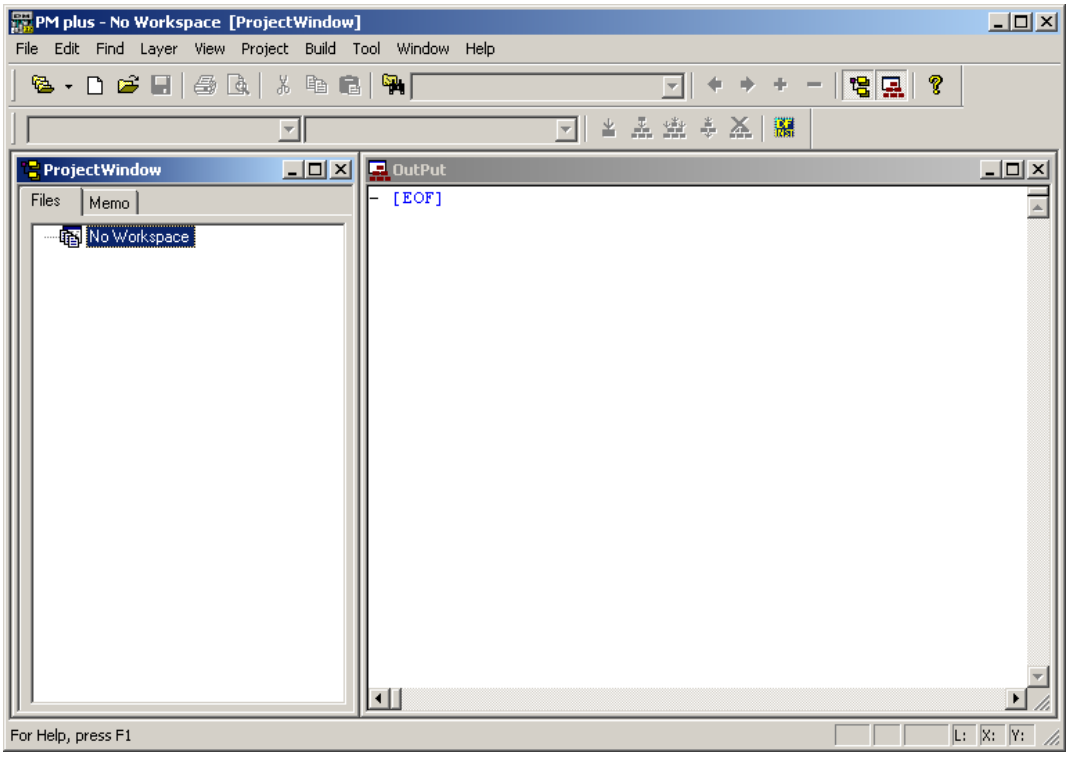
The overall steps are as follows:



2.1 Start PM Plus

Let's start using the development tools.
First, start the PM Plus
Select "Windows Start Menu" -> "Program" -> "NEC Tools32" -> "PM plus".

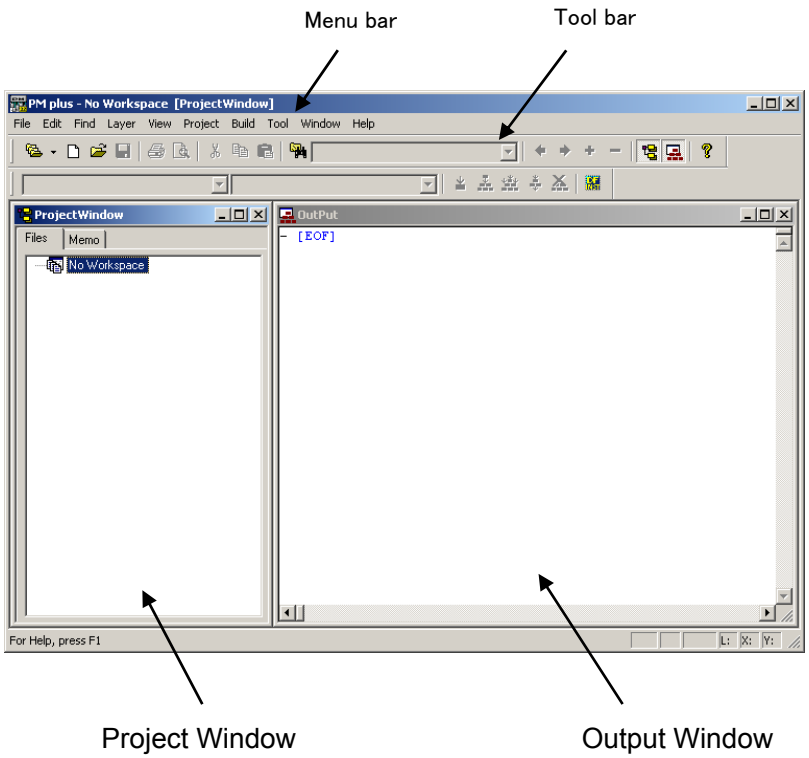
PM+ starts up



2.2 What is PM Plus

In PM Plus, application programs and environment setting are handled as a single project, and series of actions such as program creation using the editor, source management, build, and debugging are managed.

Also, one of more project files is managed together as a workspace.



Project window	A window in which project names, source files, and include file are displayed using a tree structure.
Output window	A window in which the build execution status is displayed.

For details regarding menu bars and tool bars, refer to "Help" menu in PM Plus.
"Help" on menu bar , then "PM Plus Help"

What is a project?

A project is the unit that is managed by PM Plus. A project refers to an application system and environment development based on PM Plus.

PM Plus saves project information in a "project file".

What is a project file?

A project file contains project information that includes the source files, device name, tool options for compiling, editor, and debugger information.

The file name format is "xxxxx.prj".

Project files are created in the directory you specifies when you create a new workspace.

What is a project group?

A project group is a group comprised of a number of projects in an application system.

The target device of each project must be the same within a project group.

What is a workspace?

A workspace is the unit used to manage all the projects and project group required for one application system.

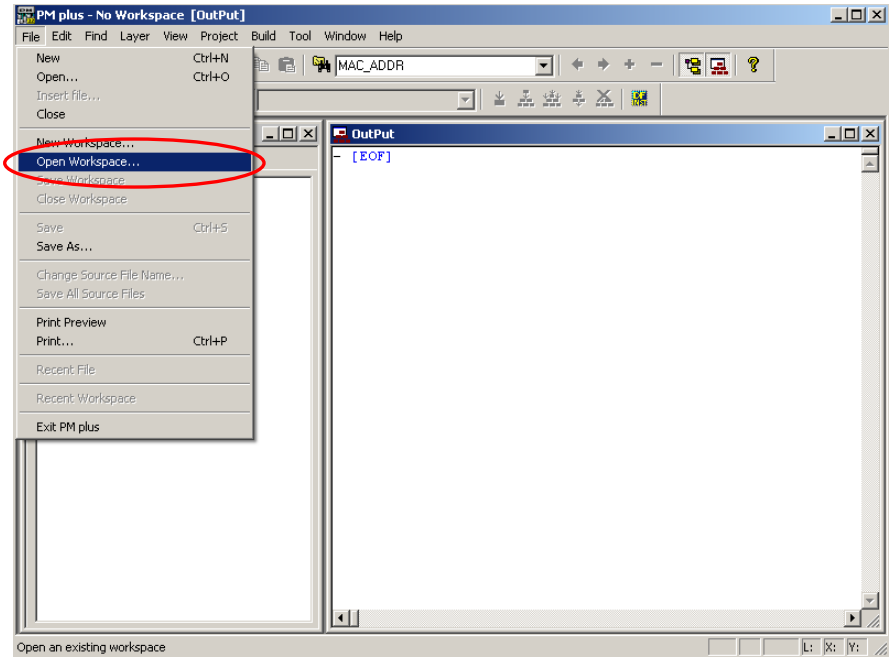
A workspace file contains one or more project files.

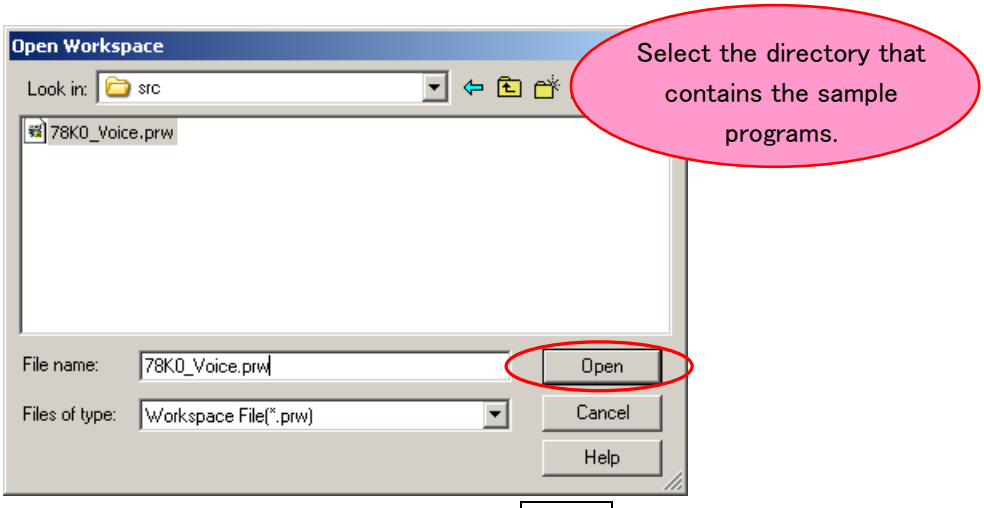
The file name format is "xxxxx.prw".

2.3 Load Workspace (project)

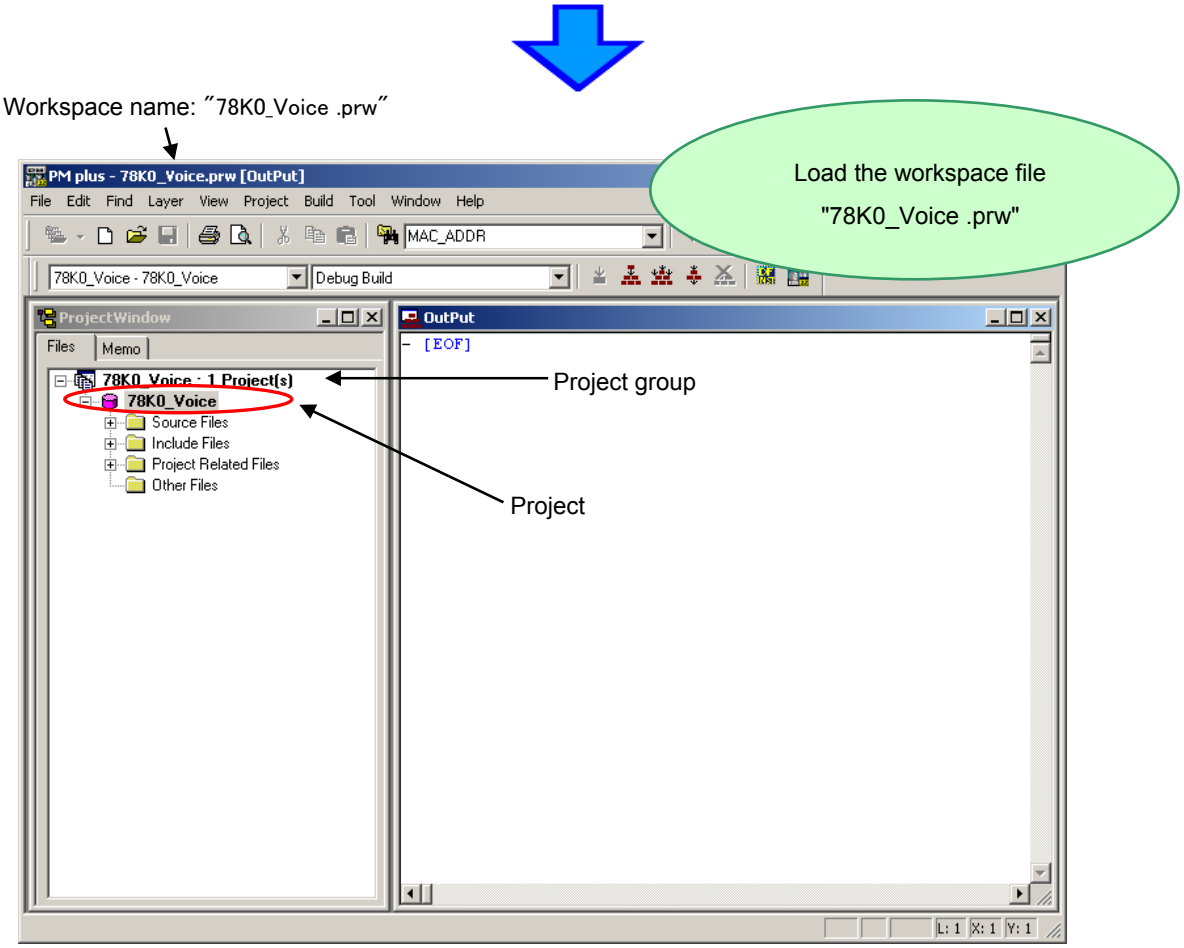
In this section, you will use the workspace that you created in "1.4 Sample Programs"
For creating a new workspace, refer to "Chapter 6 Other Information".
The workspace has information about the build environment for the sample programs.

Select "File" on menu bar and "Open Workspace…".
Then, select "78K0_Voice .prw" under the directory "TK78K0¥Eng_78K0_Voice¥src¥".





Select "78K0_Voice .prw", then click Open .



The workspace file "78K0_Voice .prw" contains one project called "78K0_Voice". You will use this project "78K0_Voice".

CAUTION:

Please ignore when you get a prompt saying "files could not be found". This may occurred when the installation directory is not a default.

2.4 Set Linker Options

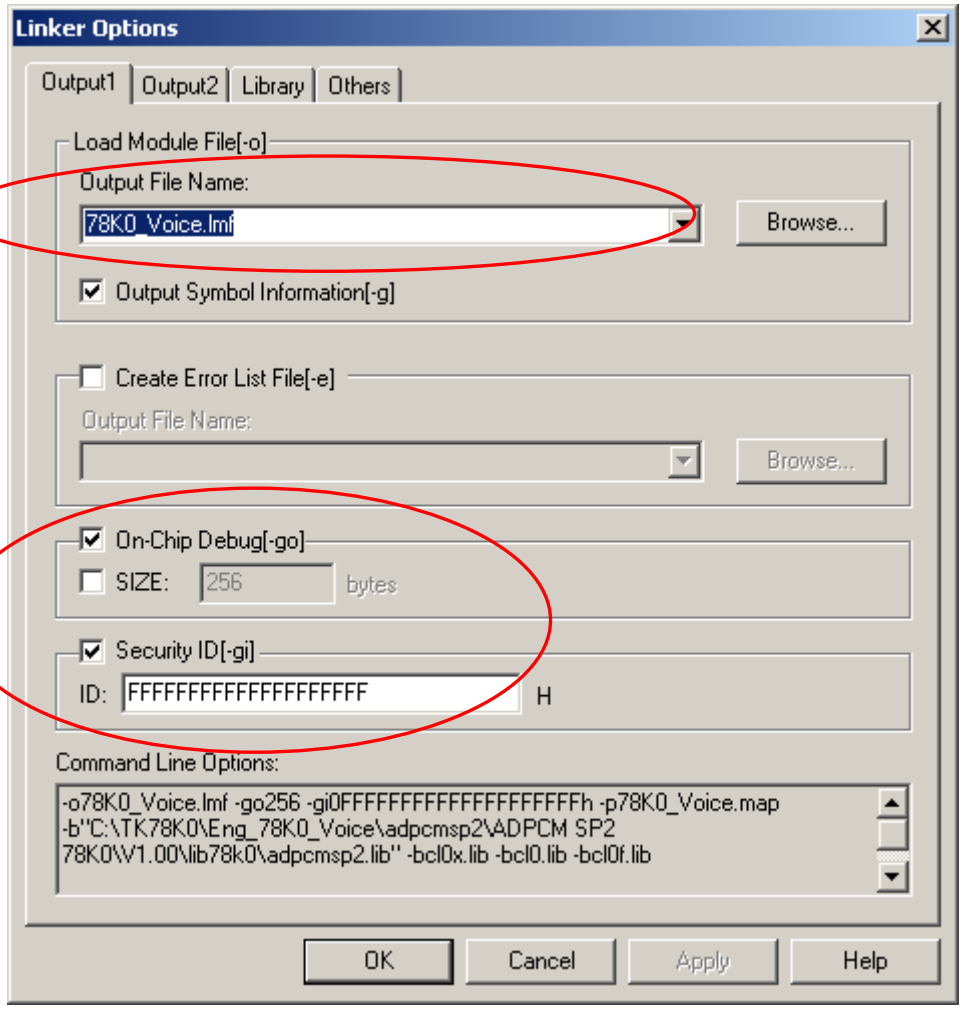
The linker options have been set by the project file. However, some option settings will be covered in this section because the linker option settings are important for debugging. Following two settings are covered specifically.

- Outputs from debugging
- On-chip debug (Disable/Enable, security ID)

Select "Tools" on menu bar, then "Linker options....".

2.4.1 "Output1" Tab

Select "Output1" tab on "Linker Options" window. Confirm "Output Symbol Information" and "On-Chip Debug" are checked.
Also, confirm "Security ID" and confirm "FFFFFFFFFFFFFFFFFFFF" (20 of "F") is entered at "ID" field if there will not be a problem entering it.



"Output File Name" filed at "Load Module File" specifies the path and file name of output load module file.
When "Output Symbol Information" is checked, it outputs the local symbol information in the load module file.
"On-Chip Debug" specifies if you need to use on-chip debug or not. Check this when you wish to use on-chip debug. In this case, you cannot locate segments in the address from 02H to 03H and from 8FH to the bytes specified at "SIZE" + 1.
"Security ID" is the ID code to protect the memory data from others.
The ID code is set with hexadecimal number. The security ID is stored at the address 85H-8EH. For that reason, when a security ID is set, you cannot locate segments in the address 85H-8EH.
If there is a security ID set in the assembler source code and another security ID in this option, the system uses the one in this option.

If you forgot the security ID code in the address 0x85-0x8E or you write 0x00 at 0x84, ID78K0-TK will not be able to connect.
In this case, run "PG-FPL3" and erase the built-in flash memory.
For details, refer to "6.3.8 Erase microcontroller built-in flash memory".

2.5 Set Compiler Options

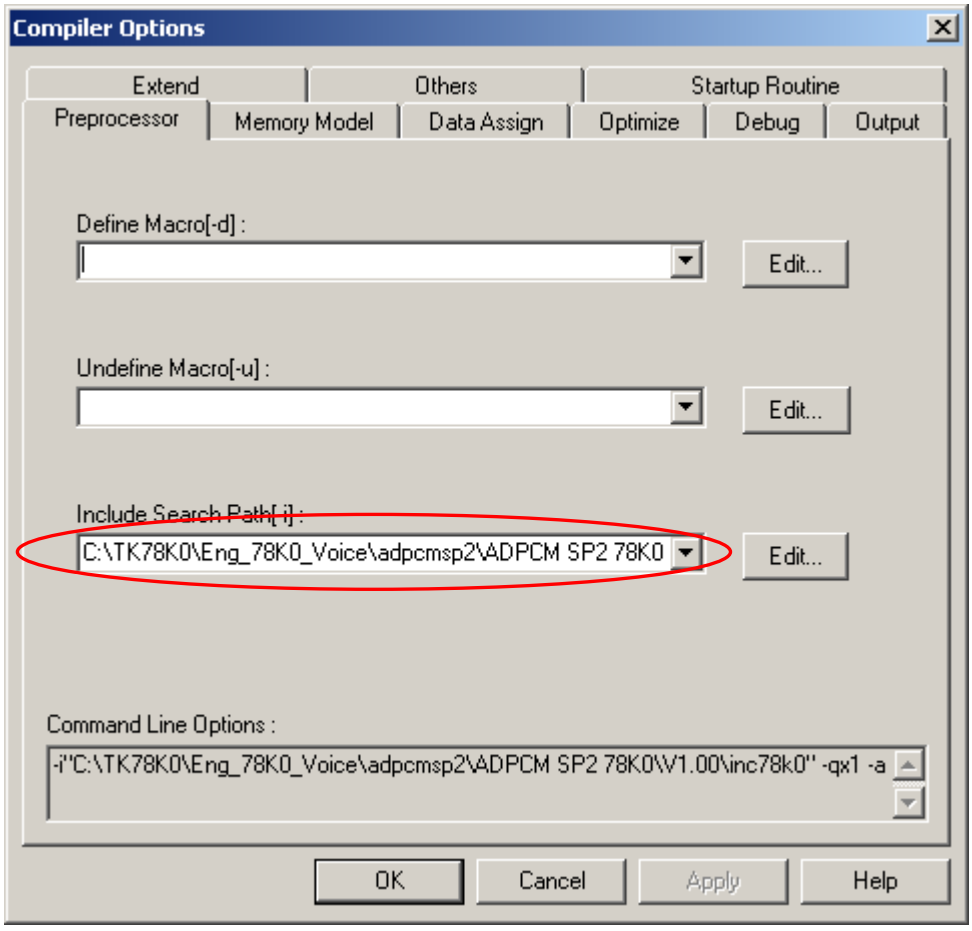
The compiler options have been set by project file. However, because some compiler options are useful, following two settings are covered specifically in this section.

- Include file pass
- Enable C++ comments

Select "Tools" on menu bar, then "Compiler options".

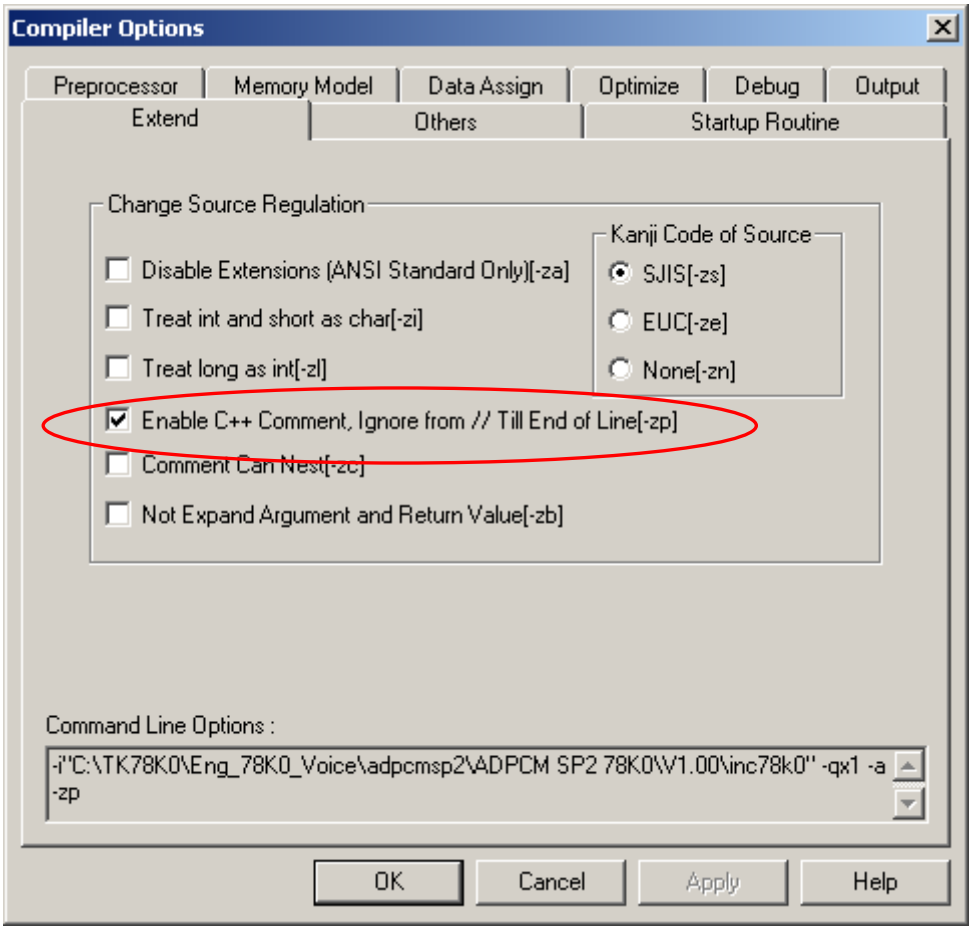
2.5.1 "Preprocessor" tab

Confirm that the "Include Search Path" combo box is set to "C:¥TK78K0¥Eng_78K0_Voice¥adpcmsp2¥ADPCM SP2 78K0¥V1.00¥inc78k0".
You should select the directory that the include files are stored. You can select multiple directories as well.



2.5.2 "Extend" Tab

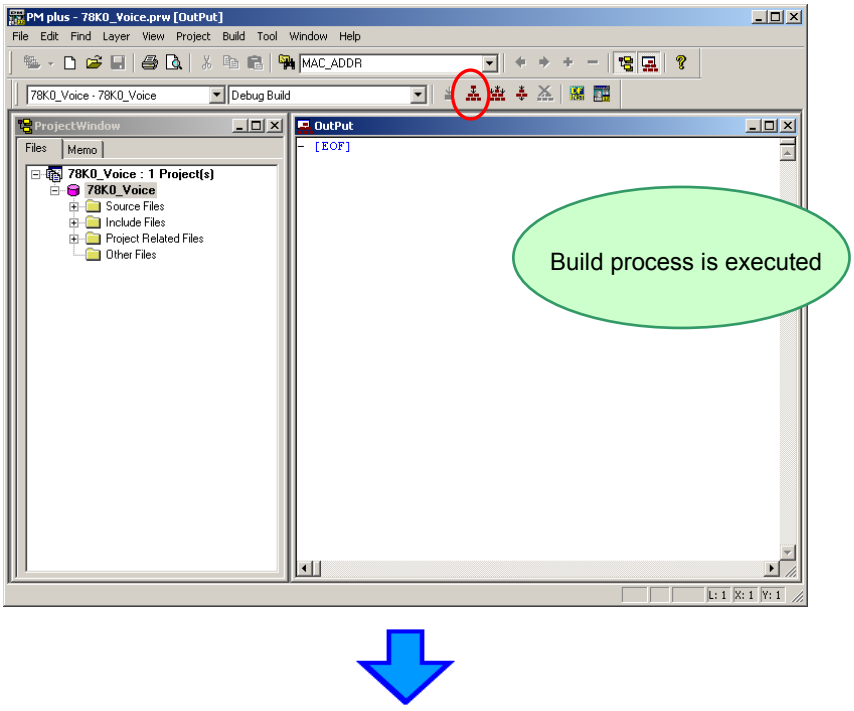
Select "Extend" tab, and check "Enable C++ Comment".
This setting allow you to use the C++ comment using "//".
It is useful feature when developing code.

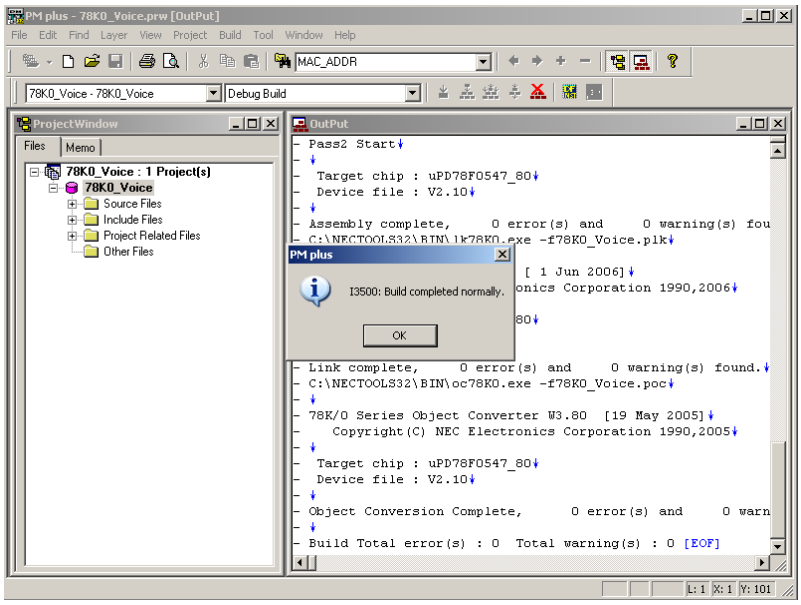


2.6 Create Load Module Files

After developing the source code, you have to create load module files by compiling, assembling, and linking. This process is called build.

Click the build button , or select "Build" on menu bar, then "Build".





Build has been completed successfully.

What is build?

Build is a function that creates an executable file from source files in a project.
PM Plus automatically performs compiling, assembling, linking, and other processing actions.
To reduce the time for the build, PM Plus detects and compiles/assembles only the files that have been updated from the previous build process.

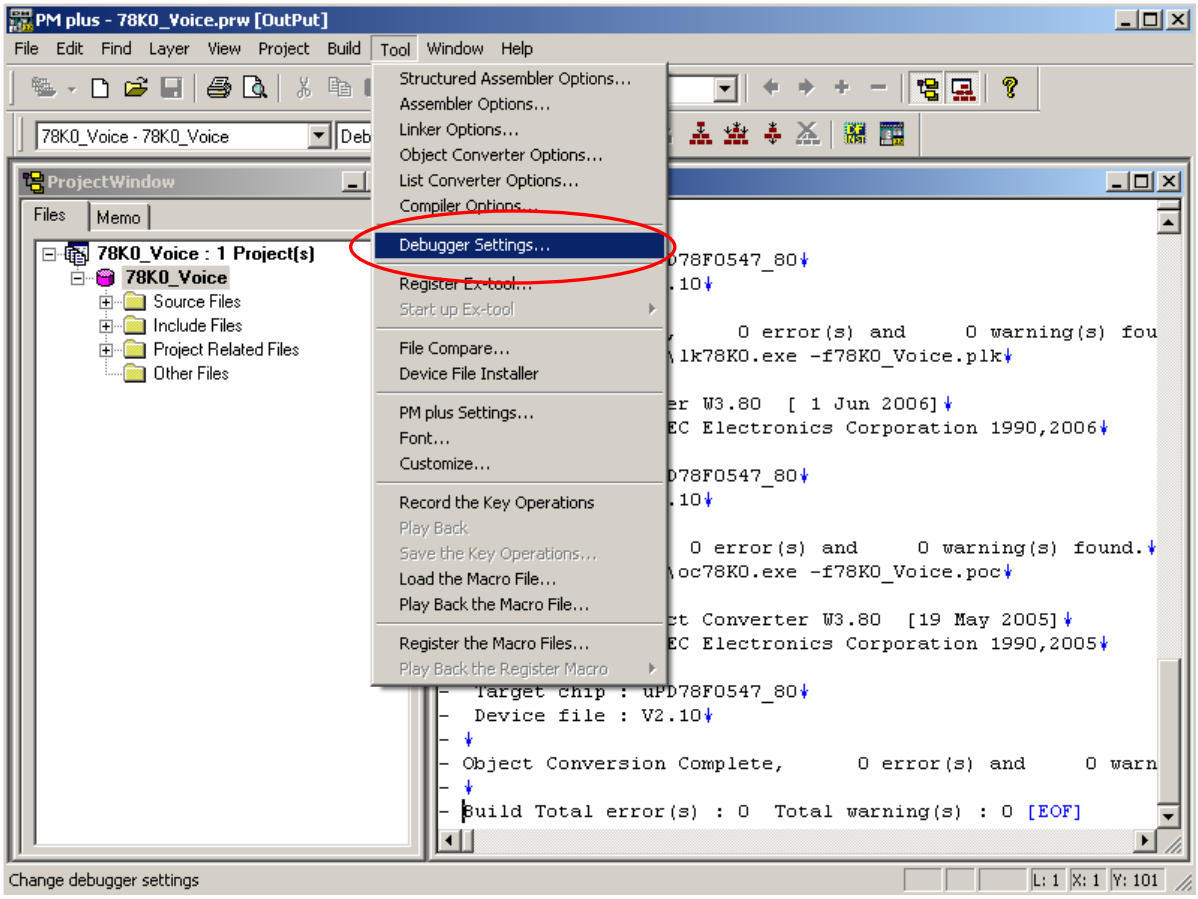
What is rebuild?

Build compiles and assembles only the source files that have been updated from the previous time, whereas rebuild compiles and assembles all the source files.
When setting, such as compiler options, have been changed, you must rebuild instead of build.

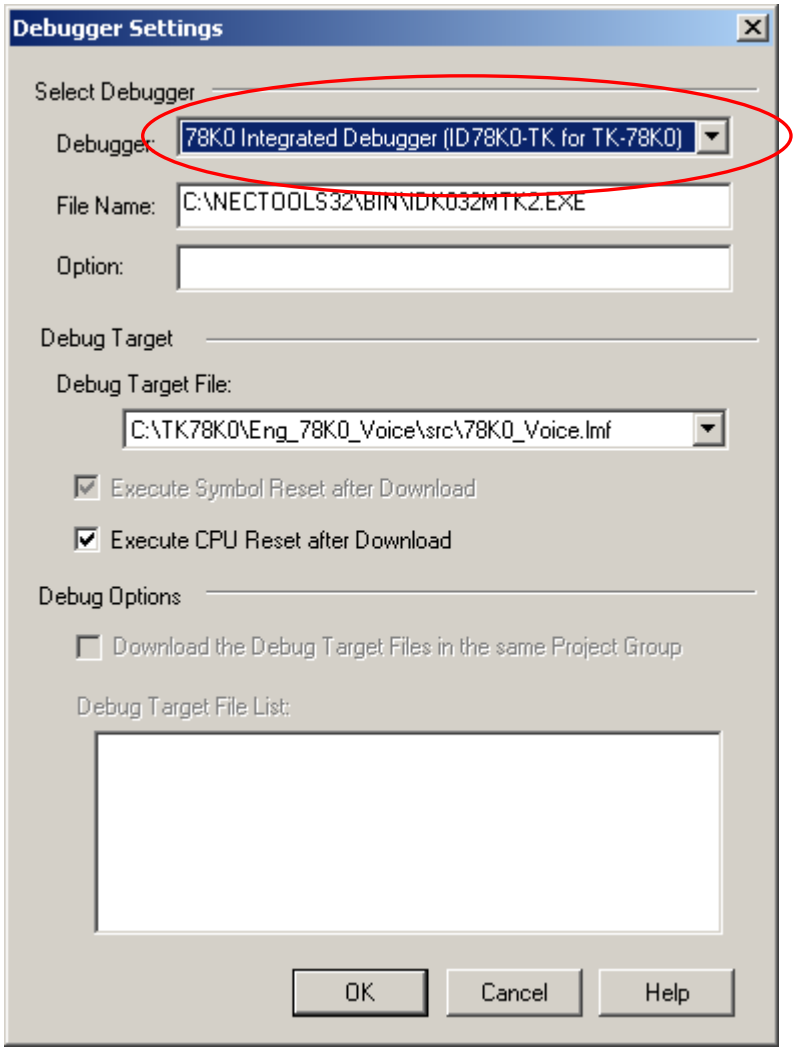
2.7 Check Debugger Settings

After the build, you should configure the debugger settings.
The debugger settings have been set by the project file as well. However, because those settings are important for debugging, some settings are covered in this section.

Select "Tools" on menu bar, then "Debugger Setting...".



Check if "ID78K0-TK Integrated Debugger" is selected on "Debugger".

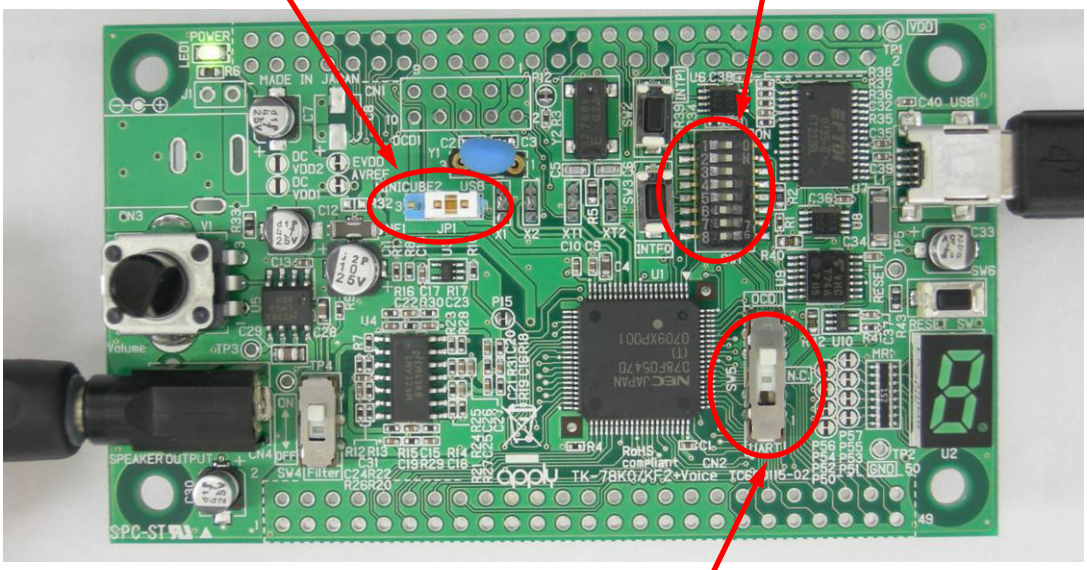


2.8 Check Board Settings

Before connecting the PC and the TK-78K0/KF2+Voice with USB, you should check the setting of SW1, SW5 and JP1 on the board.
Set the SW1, SW5 and JP1 of the TK-78K0/KF2+Voice as follows.

JP1settings
1-2 short

SW1settings							
1	2	3	4	5	6	7	8
ON	ON	ON	ON	ON	OFF	OFF	OFF



SW5 settings
OCD side

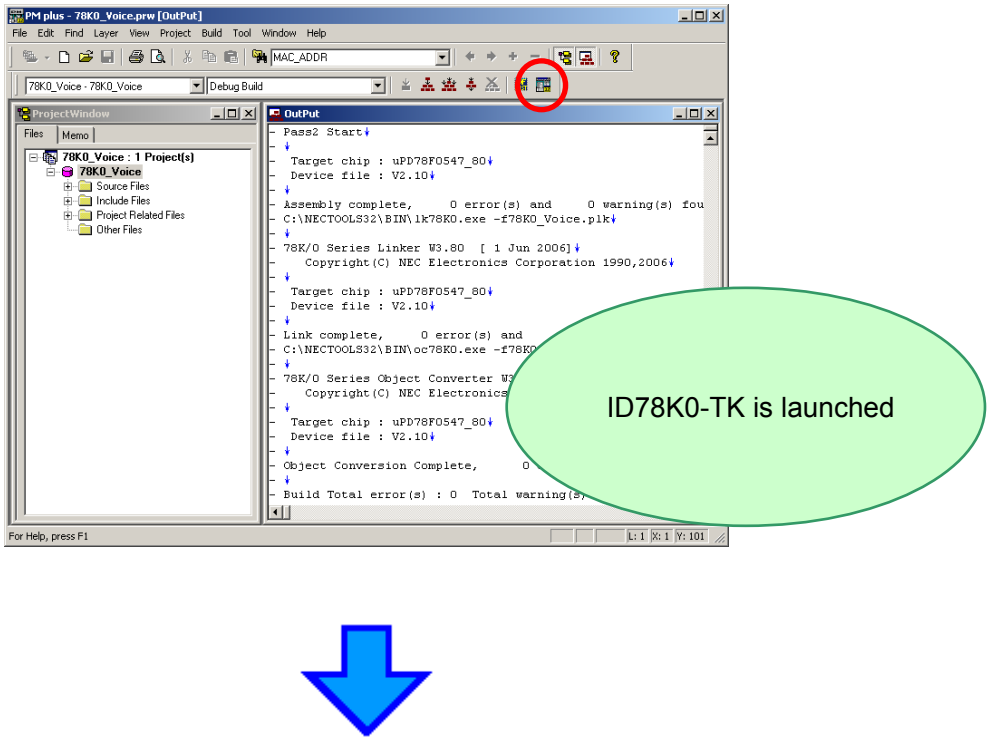
Connect a speaker to CN4 on TK-78K0/KF2+Voice.
After the switch settings are completed, connect the PC to USB1 on TK-78K0/KF2+Voice with USB cable.
If the "Found New Hardware Wizard" is started, install USB driver with referring "1.3 Installation of USB Driver".

2.9 Start Debugger (ID78K0-TK)

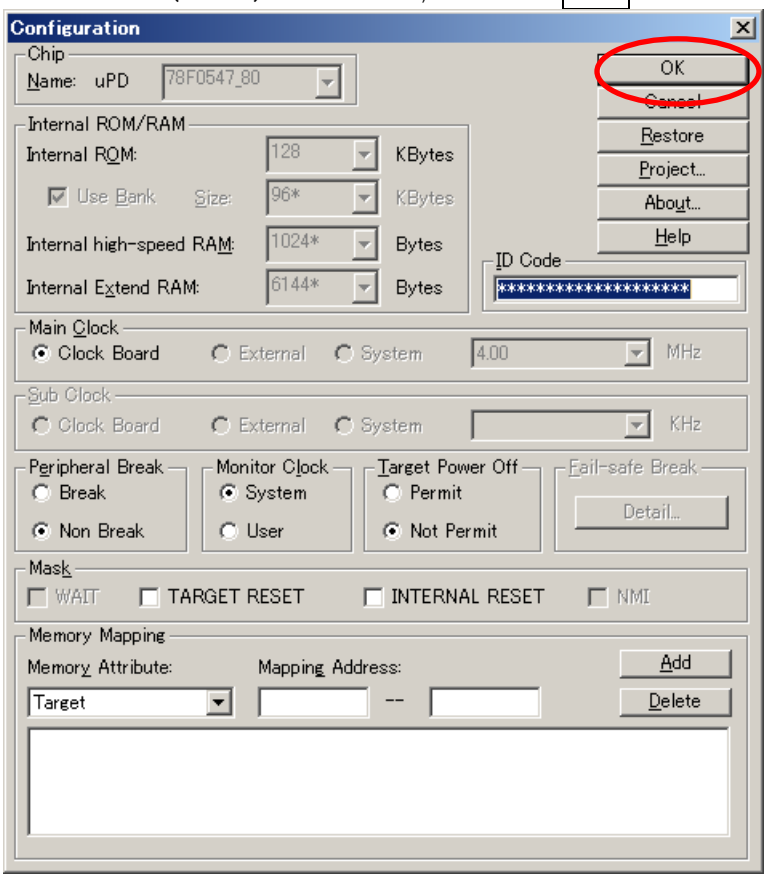
Click the debug button , or select "Build" on menu bar, then "Debug".

If you do not see the debug button, go to "2.7 Check Debugger Settings" for changing the settings.

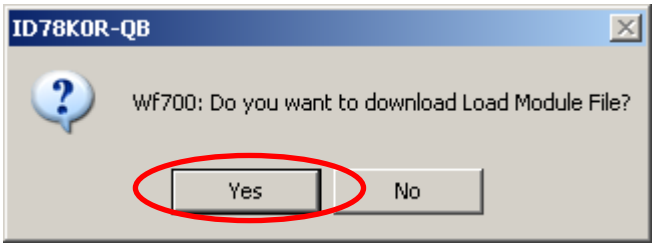
The steps to start the debugger will be explained below.

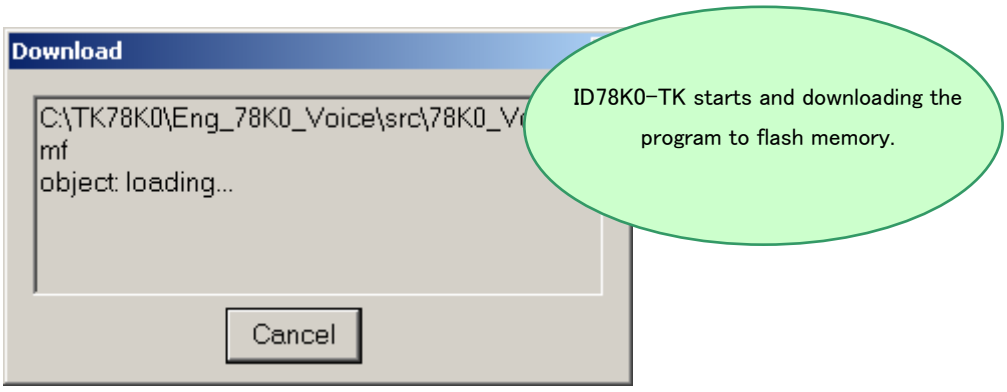


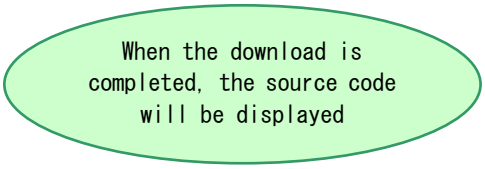
"Configuration" dialog is opened.
Enter "FFFFFFFFFFFFFFFFFFFF" (F x 20) in "ID Code", then click OK .

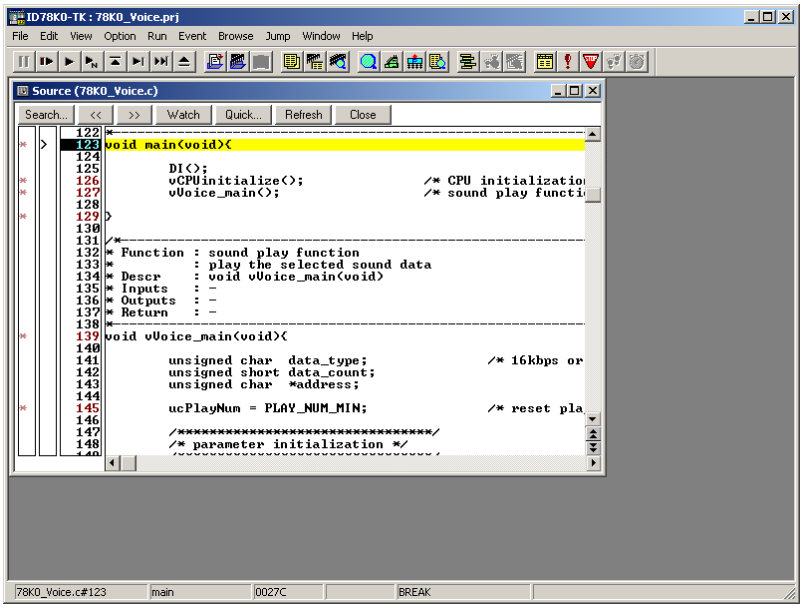


Click Yes when the confirmation dialog for downloading load module file is opened.









NOTE:

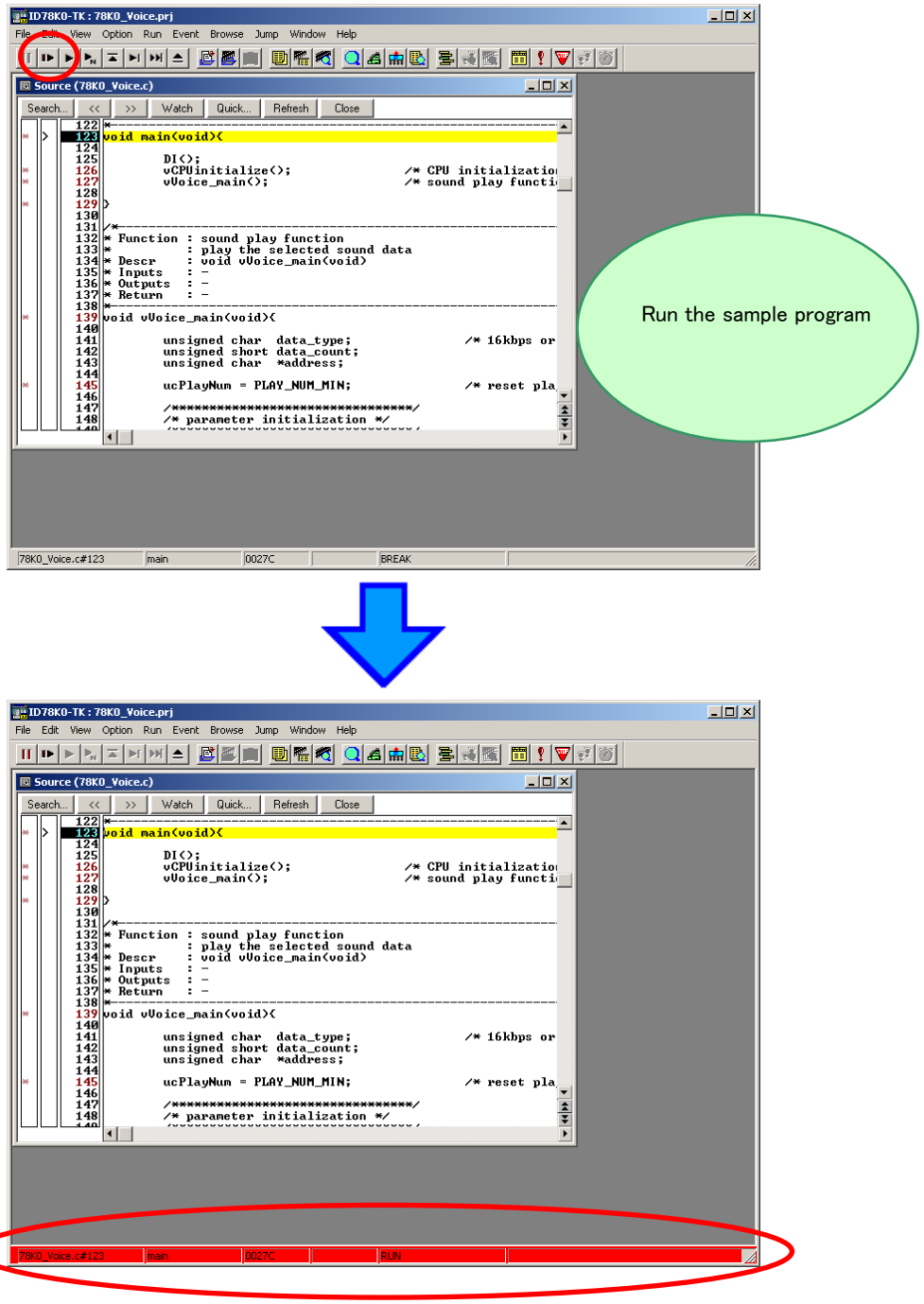
Completion of the download does not mean running the programs.
To run the sample program, see "2.10 Run Programs".

2.10 Run Programs

Now, you are ready to run the program.

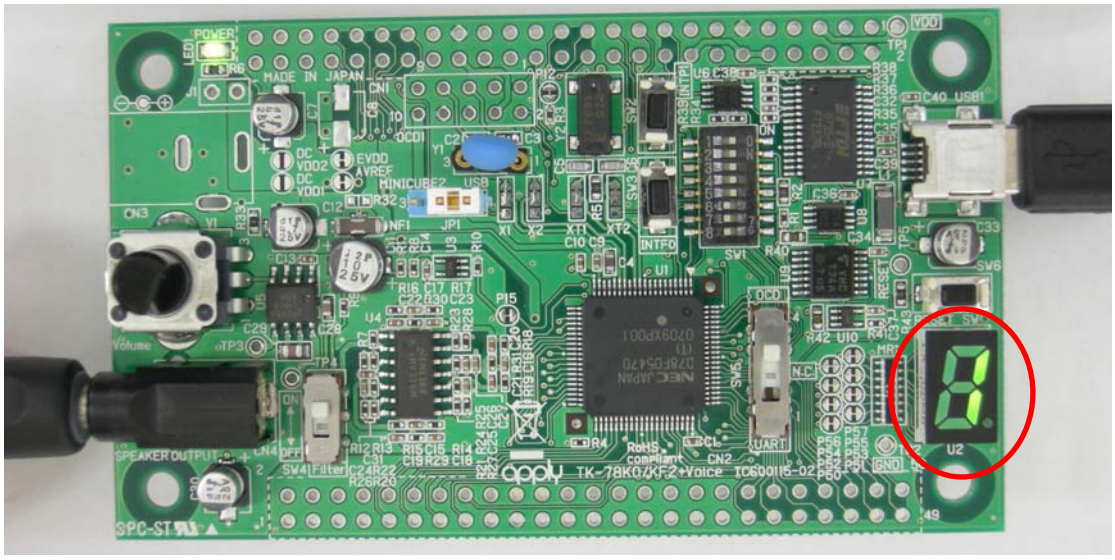
Click the restart button , or select "Run" on menu bar, then "Restart".

The sample program runs.



When programs are running, the status bar will be red.

Confirm the displaying '1' on 7 segment LED.



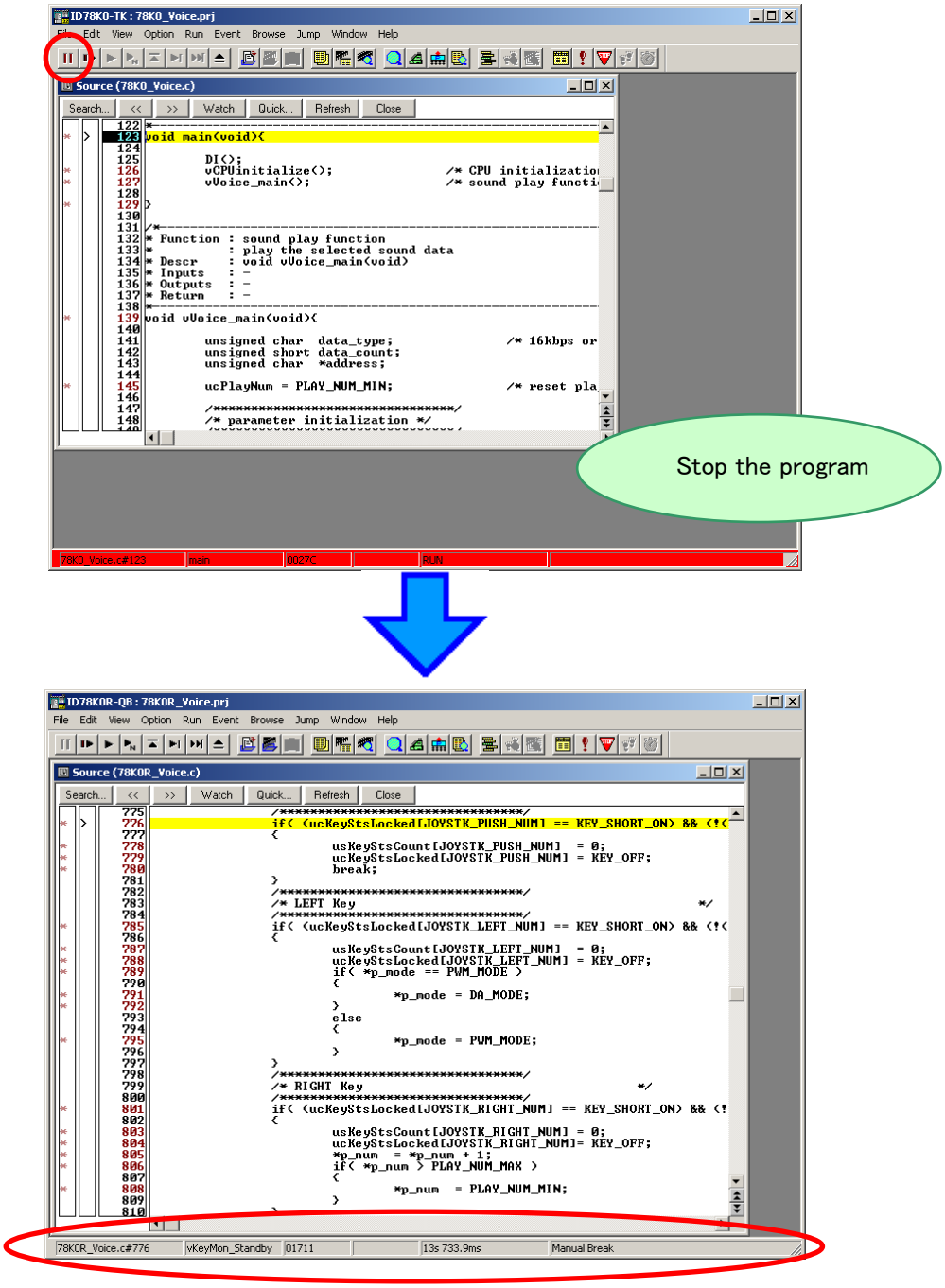
You could confirm the sample program is working.

- The sample programs contain 4 different audio data. By using the SW3, you can play the sound.
- For more information about the functions that are used in those sample program, see "Chapter 4 Sample Programs".
- When the USB power supply has noise, the output sound data will have noise as well.

2.11 Stop Programs

Now, you are going to stop the program.

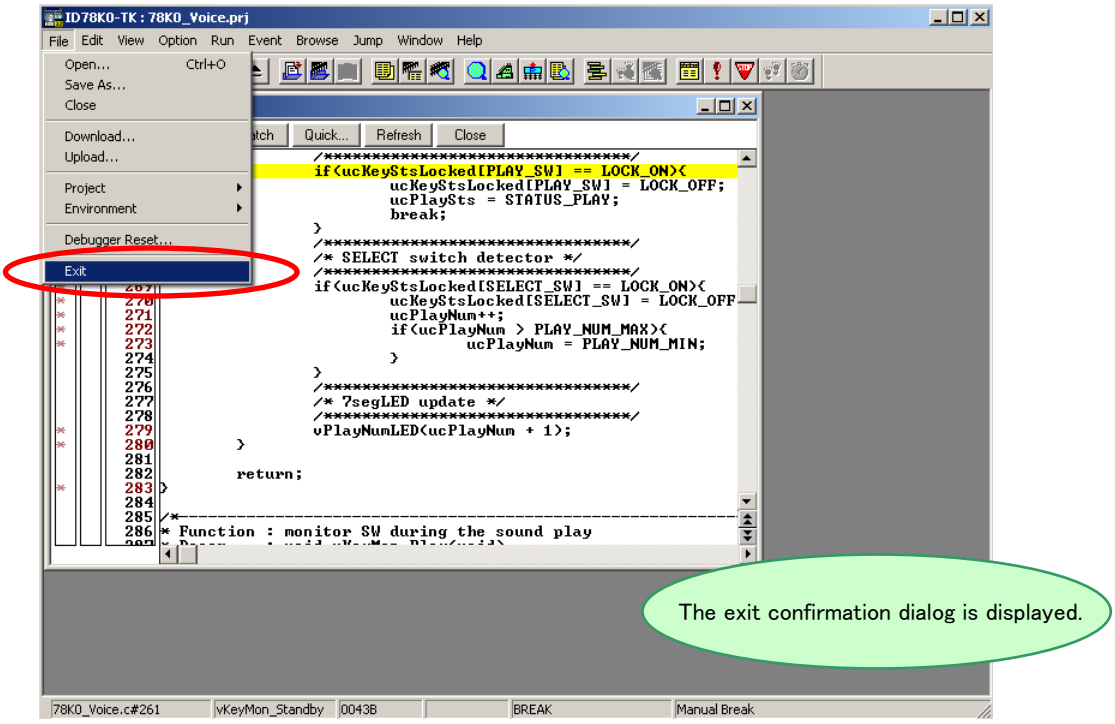
Click the stop button , or select "Run" on menu bar, then "Stop".

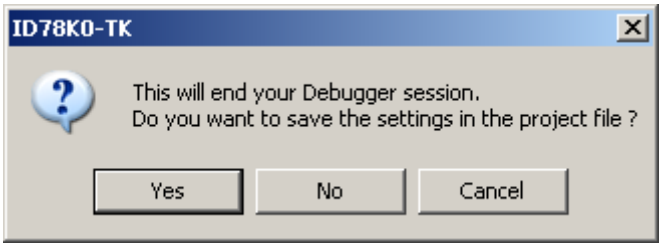


When the program stops, the status bar changes back to the original color.

2.12 Close Debugger (ID78K0-TK)

Select "File" on menu bar, then "Exit".

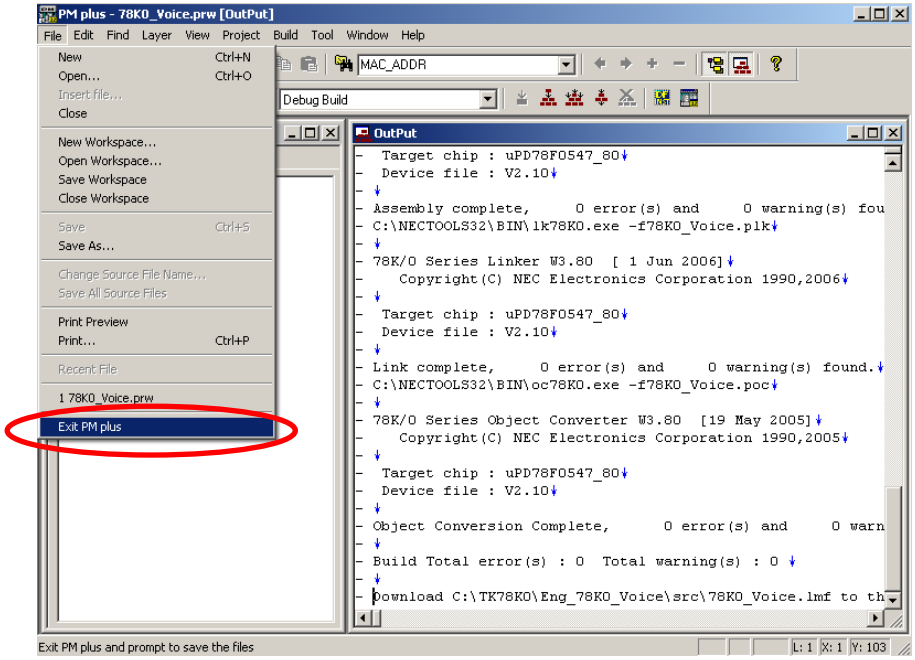




If you click Yes , it saves the settings in the project file, and then closes the ID78K0-TK. It is recommended to save the settings as it saves the window you used, window size, layout, etc.
If you click No , it does not save the settings and closes the ID78K0-TK.

2.13 Quit PM Plus

Select "File" on menu bar, then "Exit PM Plus".



PM Plus is closed.

The experiences section ends now.
You can find more information how to use the development tool and information about other useful features in "Chapter 6 Other Information".

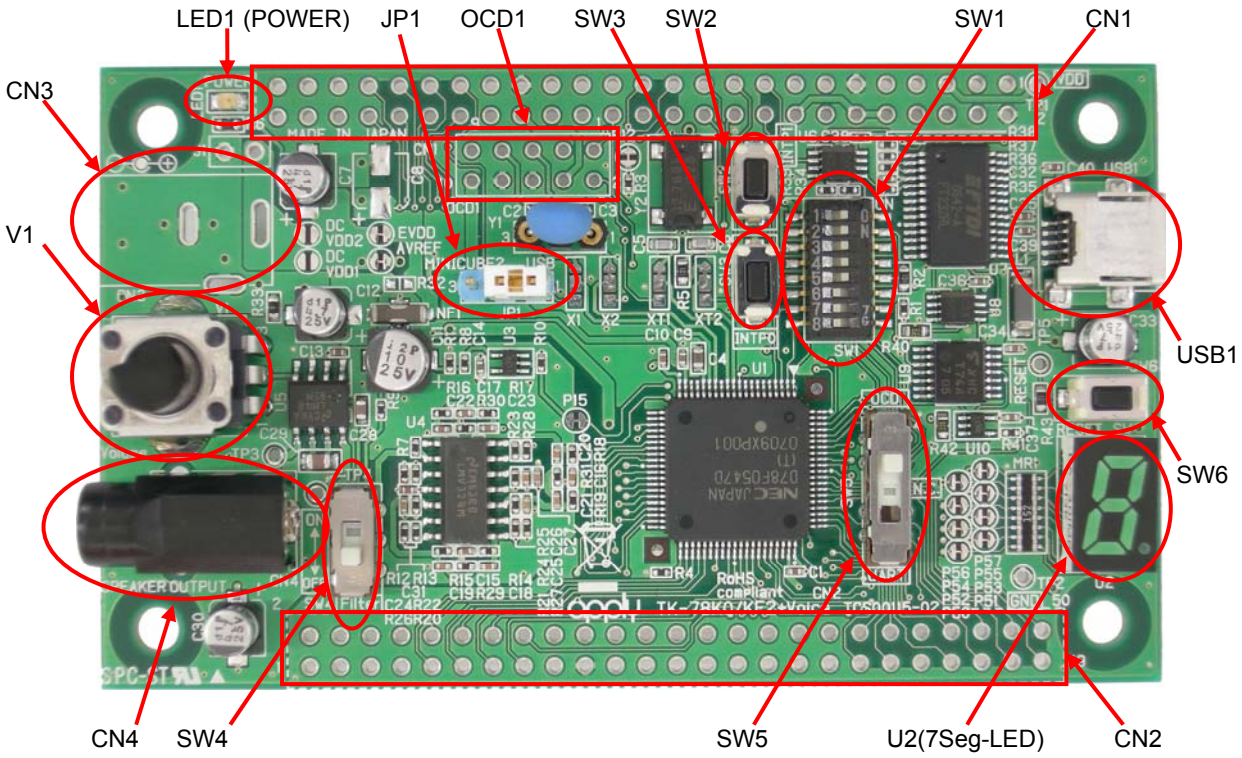
CHAPTER 3　Hardware Specifications

In this chapter, the hardware of TK-78K0/KF2+Voice will be explained.

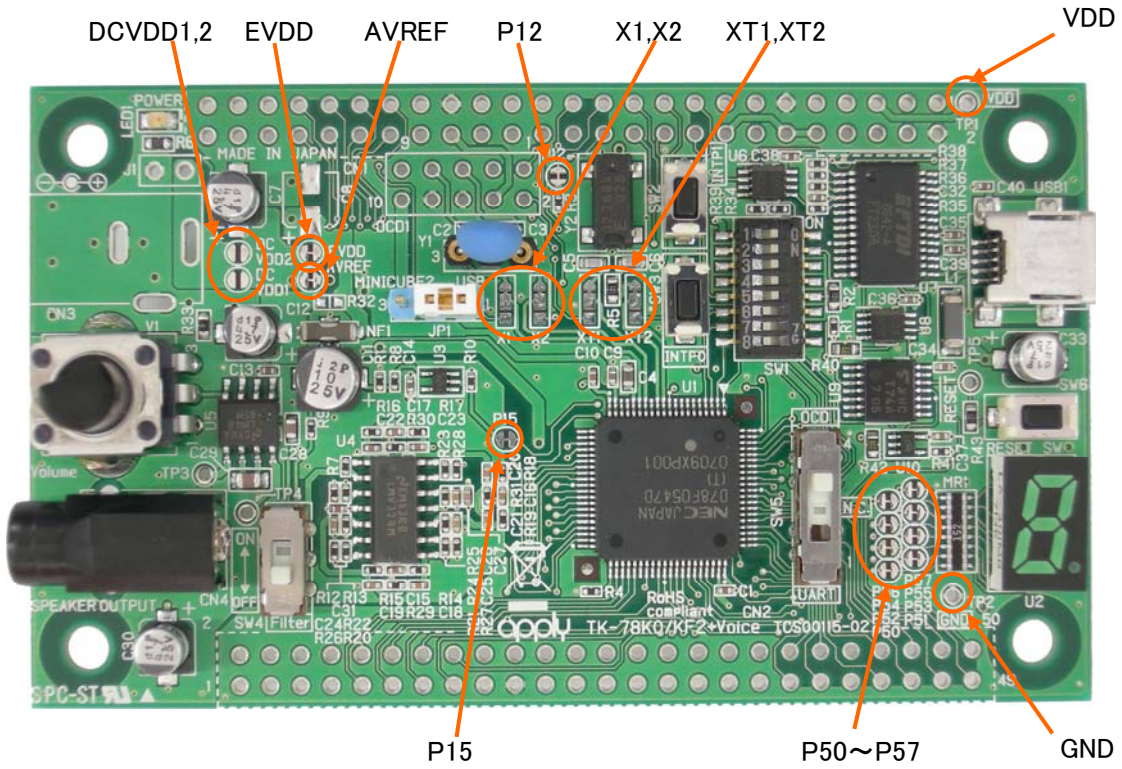
Microcontroller	μPD78F0547D　*78K0/KF2
Clock	External main system clock: 20MHz Subsystem clock: 32.768KHz Internal high-speed oscillation clock: 8MHz Internal low-speed oscillation clock: 240 kHz
Audio	PWM output Filter：LMV324M : Filter ON/OFF selectable(SW4) AMP：LM4865M Jack：3.5mm monaural (speaker output)
Interface	USB (USB1) MINICUBE connector （OCD1）
Power supply voltage	5V (USB)
Input/output for operation check use	・Push switch (SW2,SW3) ・Dip switch (SW5) ・Volume control (V1) ・7Seg-LED(U2) ・Reset switch (SW6)

＊ The name with bracket is the name printed on the board.

3.1 Layout of hardware functions



3.2 Layout of solder-short pad and test pad



3.3 Hardware Functions

3.3.1 SW1, SW5

The bit 1-5 on SW1 are for mode settings, and bit 6-8 are DIP switches connected to P45-P47 pins in microcontroller.
SW5 is slide switch for mode settings.

● For the use of ID78K0-TK, use following settings.

SW1

Bit 1	ON
Bit 2	ON
Bit 3	ON
Bit 4	ON
Bit 5	ON

SW5 [OCD] side

※1 The reset signal make the CPU reset after the sampling by ID78K0-TK. Because of this, there is time-lag about a few 100mSec from the external reset command. By setting Bit 2 to OFF, you can remove this time-lag,. However, the reset mask function of ID78K0-TK will not work by this change.

※2 When you use ID78K0-TK, it uses P31 and P32 pins to communicate with the host machine. Therefore, you cannot use those pins.

● To run the programs stored in built-in flash memory without using ID78K0-TK, use following settings and re-supply power.

SW1

Bit 1	OFF
Bit 2	OFF
Bit 3	OFF
Bit 4	OFF
Bit 5	OFF

SW5 [UART] side

● To write data on CPU built-in flash memory by using PG-FPL3, set the switches as shown below. (The hardware for PG-FPL3 is incorporated in TK-78K0.)

SW1

Bit 1	ON
Bit 2	ON
Bit 3	OFF
Bit 4	OFF
Bit 5	OFF

SW5 UART side

● To connect MINICUBE, set the switches as shown below.

SW1

Bit 1	OFF
Bit 2	OFF
Bit 3	OFF
Bit 4	OFF
Bit 5	OFF

SW5 UART side

● The bit 6-8 are connected to P45-P47 pins in microcontroller. ON means "Low" and OFF means "Open". When you need to use this, you need to set the microcontroller built-in pull-up resistor option registers (PU4) to ON. For details about settings of microcontroller built-in pull-up resistor option registers, refer to 78K0/KF2 User's Manual (U17397).

SW1

Bit 6	P45
Bit 7	P46
Bit 8	P47

● SW5 N.C. side (middle)

Nothing will be connected to P13 and P14.

3.3.2 SW2 (INTP1)

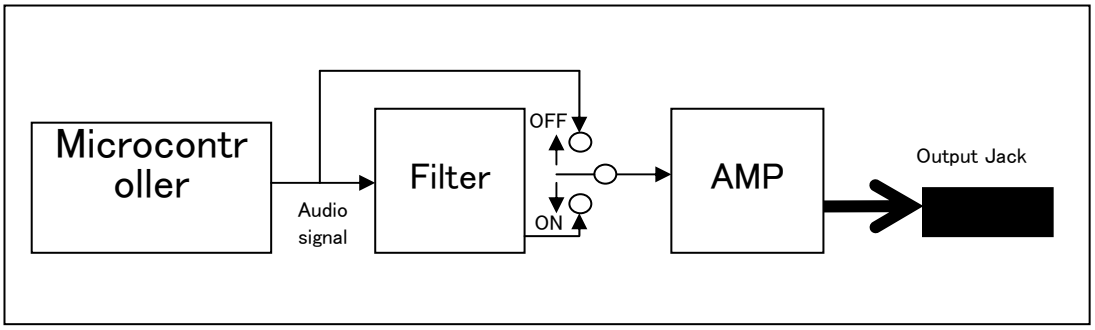
SW2 is the push switch connected to "P30/INTP1" pin in CPU. When the switch is pushed down, it sends the signal of "Low". When it is released, it becomes "Open". Therefore, when you need to use this, you need to set the microcontroller built-in pull-up resistor option registers (PU3) to ON. For details about settings of microcontroller built-in pull-up resistor option registers, refer to 78K0/KF2 User's Manual (U17397).

3.3.3 SW3 (INTP1)

SW3 is the push switch connected to "P120/INTP0/EXLVI" pin in microcontroller. When the switch is pushed down, it sends the signal of "Low". When it is released, it becomes "Open". Therefore, when you need to use this, you need to set the microcontroller built-in pull-up resistor option registers (PU12) to ON. For details about settings of microcontroller built-in pull-up resistor option registers, refer to 78K0/KF2 User's Manual (U17397).

3.3.4 SW4 (Filter)

SW4 is the slide switch to select use/not use of the Filter (LMV324M). When it sets to "OFF", it does not use the Filter and it inputs sound signals from microcontroller to AMP.



3.3.5 SW6 (RESET SW)

This is the reset switch. You can reset the microcontroller by pressing this switch.

3.3.6 JP1

JP1 is the jumper switch pin to select power supply.

JP1

1-2 Short	Use power supply from USB power connected to USB1
2-3 Short	Use power supply from MINICUBE connected to OCD1(Not mounted)
Open	Use power supply from outside

3.3.7 COD1

OCD1 can connect to MINICUBE by installing a connector. (A1-10PA-2.54-DSA[not mounted] by Hirose)

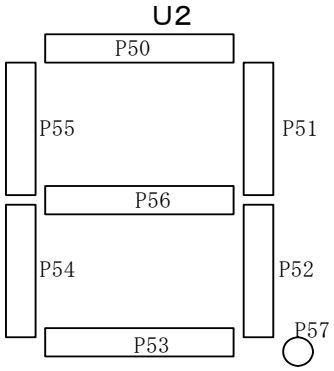
Please do the following setting when you connect MINICUBE.

- Pull out the oscillator that the socket is mounted on Y1.
- Set the SW5 to UART side when you communicate through PC with the terminal UART6 (P13/TXD6, P14/RXD6) and the terminal RXD# and TXD# connected.
- Set the bit1, 2,3,4, and 5 to OFF.

※Connect MINICUBE with noting 1pin position.

3.3.8 U2(7seg LED)

7seg LED of U2 can be turned on with P50-P57.
Set the port mode to "Output" and output a "Low" signal.



By writing the value shown below table in register P5, you can display number 0-9.

Examples for displaying numbers and the setting values

0	0xC0	5	0x92
1	0xF9	6	0x83
2	0xA4	7	0xf8
3	0xB0	8	0x80
4	0x99	9	0x98

3.3.9 LED1 (POWER)

This is the POWER LED. It is lighted when it gets power supply.

3.3.10 CN1, CN2

Connectors for external connections. The connector is not mounted.

3.3.11 CN3

The power supply of the AC adaptor connected with CN3 is connected only with the power supply terminal of the connector of the board in the surrounding (10, 12, and 16pin of CN1). However, not to tie to USB this board and to operate with the unit, the AC adaptor can be made a power supply by the connection of the AC adaptor of 5V to CN3 and the short-circuit of solder short pad (DCVDD1,2). Moreover, it is also possible to connect the stabilizing supply etc. in the lead line instead of the AC adaptor because CN3 is connected with J1 of a through hall.

- Acceptable jack (CN3) : HEC0470-01-630 by Hosiden Corp(not mounted)
- Acceptable plug : 2.1mm DC jack(center plus)
- Current capacity : 100mA or more

- J1-1pin : plus
- J1-2pin : minus

Attention : Please make JP1 Open when operating in an external power supply

3.3.12 CN4

This is the jack for external speakers. Connect a speaker when you play sound.

- Support jack: 3.5mm (monaural)
- Load impedance: 8ohm and over

3.4 Solder short pad

The circuit on the board can be customized by connecting/disconnecting the solder short pad.
The solder short pad looks like the pictures below.
To open the circuit, cut the thin part of the pad with cutter. To short, solder the pad.

Solder short pad (Opened)

Solder short pad (Shorted)

Solder short pad Select Type

Solder short pad	Default Setting	Connection	
P50～P57	Short	Short	Connect to 7segLED through 1.5KΩ
		Open	Port 5 is used for general input/output
P12	Short	Short	Control FLMD0 terminal (for self-writing)
		Open	Port 12 is used for general input/output
P15	Short	Short	Connect port 15 to sound filter circuit
		Open	Port 15 is used for general input/output
X1,X2	△Short	△Short	Use for the connection of P121,P122 and main system clock oscillator
		□Short	P121,P122 are used for general input/output
XT1,XT2	△Short	△Short	Use for the connection of P123,P124 and sub system clock oscillator
		□Short	P123,P124 are used for general input/output
AVREF1	Short	Short	VDD = AVREF1
		Open	Enable to supply different voltage to VDD terminal and AVREF1 terminal
EVDD1	Short	Short	VDD =EVDD1
		Open	Enable to supply different voltage to VDD terminal and EVDD1 terminal
DCVDD1,DCVDD2	Open	Short	Connect CN3、J1 to VDD
		Open	Disconnect CN3,J1 from VDD

3.5 CN1, CN2 terminal list

CN1 terminal list (HIF-3H-50DA-2.54DSA Hirose [not mounted])

CN1	Signal name	CPU terminal	Note
1	AVREF	AVREF	Connect to VDD with solder short pad
2	VSS	VSS,AVSS,EVSS	
3	P33	P33/TI51/TO51/INTP4	
4	P16	P16/TOH1/INTP5	
5	VDD	VDD	
6	P130	P130	
7			
8	FLMD0	FLMD0	10KΩPull-Down,SW1-1
9	VDD	VDD	
10	+12V		Connect to CN3,J1
11	VSS	VSS,AVSS,EVSS	
12	+12V		Connect to CN3,J1
13	VDD	VDD	
14	RESET0		Connect to the reset circuit
15	VDD	VDD	
16	+12V		Connect to CN3,J1
17	P124	P124/XT2/EXCLKS	Able to disconnect XT with solder short pad
18	P30	P30/INTP1	SW2
19	P31	P31/INTP2	1MΩPull-Down,SW1-14
20	P32	P32/INTP3	SW1-13
21	P141	P141/BUZ/BUSY0/INTP7	
22	P11	P11/SI10/RXD0	
23	P12	P12/SO10	Able to connect to FLMD0 with solder short pad
24	P10	P10/SCK10/TXD0	
25	RXD	P13/TXD6	SW5
26	TXD	P14/RXD6	SW5
27	P123	P123/XT1	Able to disconnect XT with solder short pad
28	P15	P15/TOH0	Use for sound output
29	P06	P06/TI011/TO01	
30	P140	P140/PCL/INTP6	
31	P60	P60/SCL0	
32	P61	P61/SDA0	
33	VSS	VSS,AVSS,EVSS	
34	EVDD	EVDD	Connect to VDD with solder short pad
35	P62	P62/EXSCL0	
36	P63	P63	

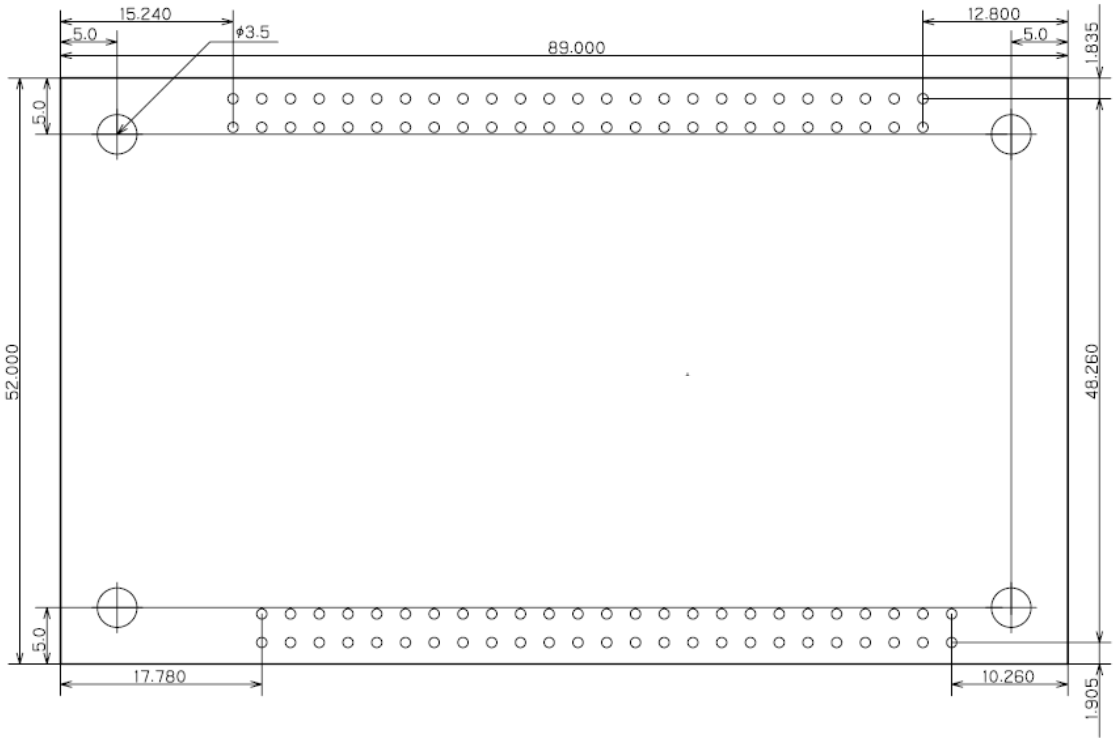
37	P70	P70/KR0	
38	P71	P71/KR1	
39	P72	P72/KR2	
40	P73	P73/KR3	
41	P74	P74/KR4	
42	P75	P75/KR5	
43	P76	P76/KR6	
44	P77	P77/KR7	
45	P121	P121/X1	Able to disconnect X with solder short pad
46	P122	P122/X2/EXCLK	Able to disconnect X with solder short pad
47	P142	P142/SCKA0	
48	P143	P143/SIA0	
49	P144	P144/SOA0	
50	P145	P145/STB0	

CN2 terminal list (HIF-3H-50DA-2.54DSA Hirose [not mounted])

CN1	Signal name	CPU terminal	Note
1	P00	P00/TI000	
2	P01	P01/TI010/TO00	
3	P02	P02/SO11	
4	P03	P03/SI11	
5	P04	P04/SCK11	
6	P05	P05/TI001/SSI11	
7	P17	P17/TI50/TO50	
8	P120	P120/INTP0/EXLVI	SW3
9	P50	P50	Connect to 7segLED with solder short pad
10	P51	P51	Connect to 7segLED with solder short pad
11	P52	P52	Connect to 7segLED with solder short pad
12	P53	P53	Connect to 7segLED with solder short pad
13	P54	P54	Connect to 7segLED with solder short pad
14	P55	P55	Connect to 7segLED with solder short pad
15	P56	P56	Connect to 7segLED with solder short pad
16	P57	P57	Connect to 7segLED with solder short pad
17			
18			
19	VSS	VSS,AVSS,EVSS	
20	EVDD	EVDD	Connect to VDD with solder short pad
21	P40	P40	
22	P41	P41	
23	P42	P42	
24	P43	P43	
25	P44	P44	
26	P45	P45	SW1-6
27	P46	P46	SW1-7
28	P47	P47	SW1-8
29			
30			
31			
32			
33			
34			
35			
36			
37	P64	P64	
38	P65	P65	
39	P66	P66	

40	P67	P67	
41			
42			
43	P27	P27/ANI7	
44	P26	P26/ANI6	
45	P25	P25/ANI5	
46	P24	P24/ANI4	
47	P23	P23/ANI3	
48	P22	P22/ANI2	
49	P21	P21/ANI1	
50	P20	P20/ANI0	

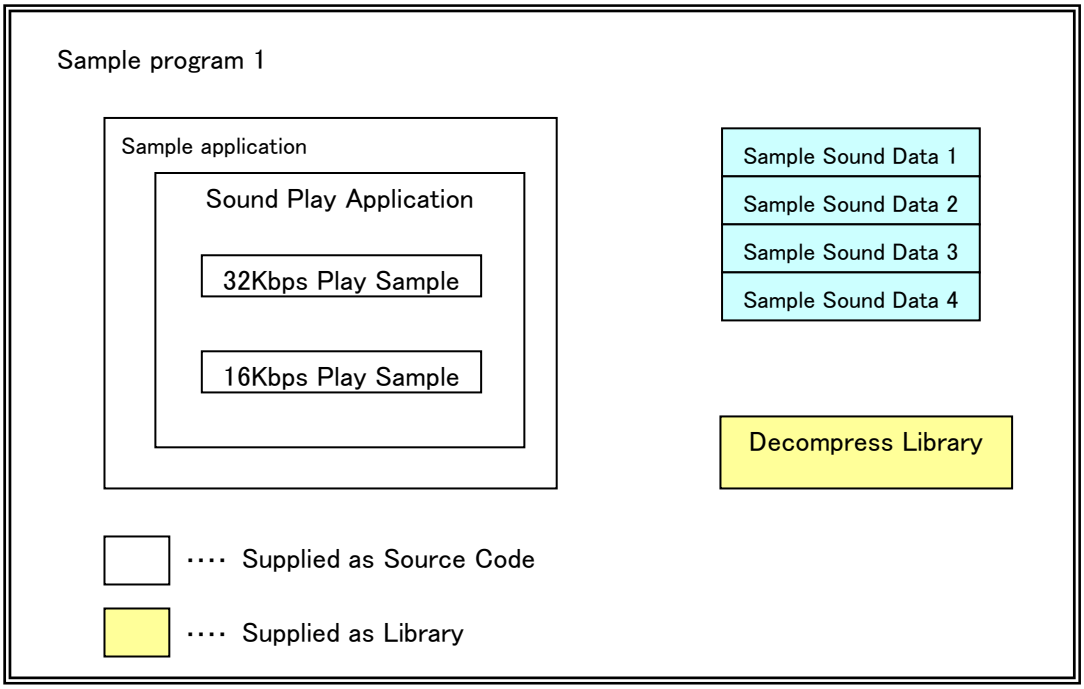
3.6 Dimension of the board



CHAPTER 4 Sample Programs

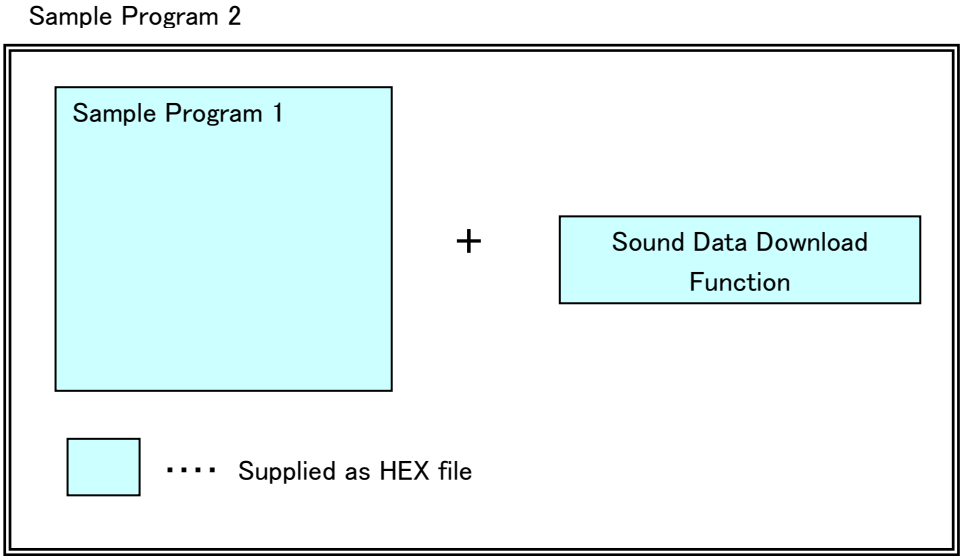
In this chapter, the sample programs are explained.

4.1 Sample Program 1 Structure



This is the program used in "Chapter 2 Experiences"
(TK78K0¥Eng_78K0_Voice¥src¥78K0_Voice.prw).
The Sample Program 1 is the simple sound play application that uses the decompress library. The source code is also included. Therefore, you can look through it to understand the processes and how to code to play sound.
For details about the Sample Program 1, refer to "TK-78K0/KF2+Voice Application Note Practice".

4.2 Sample Program 2 Structure



The Sample Program 2 is the application to download/modify the sound data by PC connection in addition to the sound play function from the Sample Program 1.
This application can be used instantly as it is written to the microcontroller as default.
It contains the HEX file only (TK78K0¥Eng_78K0_Voice¥78K0_Voice_DL.hex).

How to write HEX files

Install PG-FPL3

Run "¥FPL3¥FPL3_V110¥Setup.exe" on bundled CD-ROM from Windows Explorer. The installation starts.
PG-FPL3 cannot be installed by the integrated installer.

Write programs using PG-FPL3

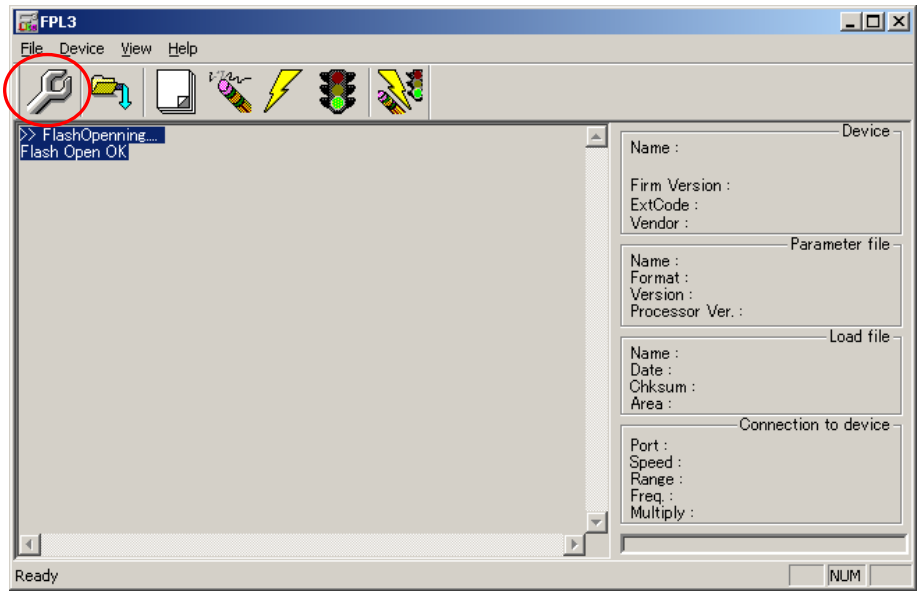
① Set the switches as shown below and connect the board and PC with USB cable.

JP1		1-2 short (USB side)
SW5		UART side
SW1	Bit1	ON
	Bit2	ON
	Bit3	OFF
	Bit4	OFF
	Bit5	OFF
	Bit6	OFF
	Bit7	OFF
	Bit8	OFF

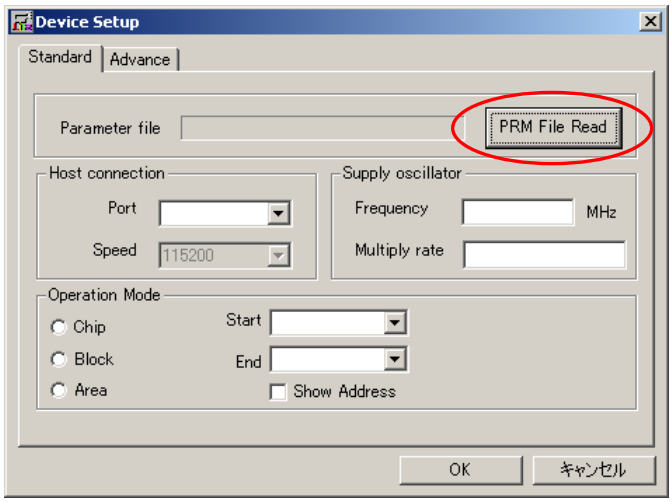
② Select "Windows Start" menu, "Programs", "NEC Tools32", then "PG-FPL3" to start PG-FPL3

③ Click the setup button.

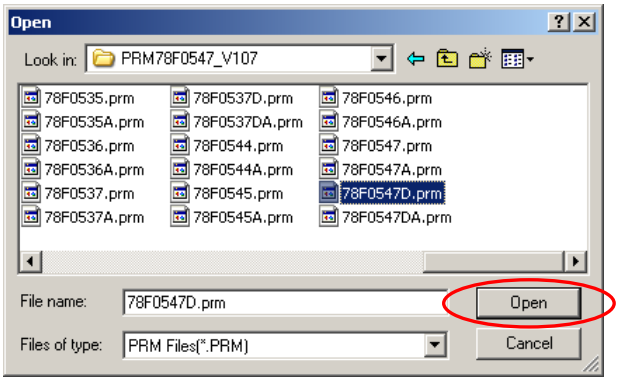
Initial Screen



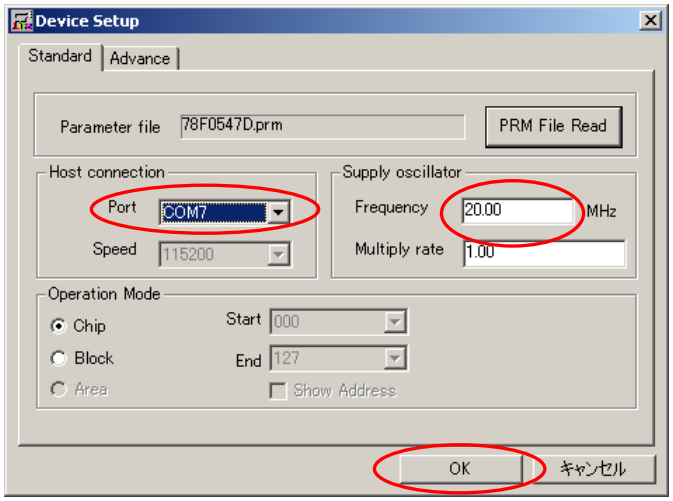
④ Click "PRM File Read" button.



⑤ Open the bundled CD-ROM and select "¥PRM¥PRM78F0547_V107¥78F0547D.prm".

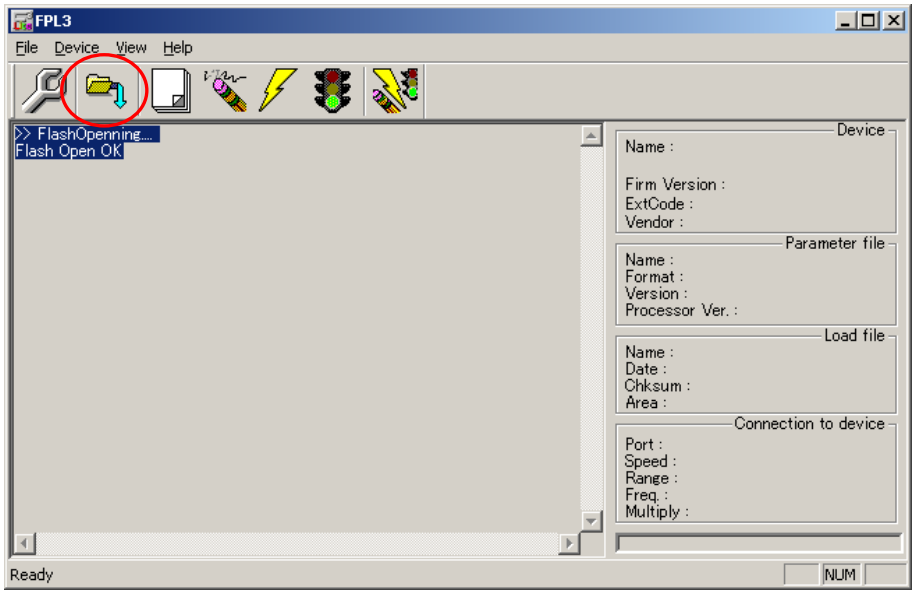


⑥ Select the COM port number that TK-78K0 is assigned in "Port" combo box. Enter "20.00" in the "Frequency" field. Click "OK" button.

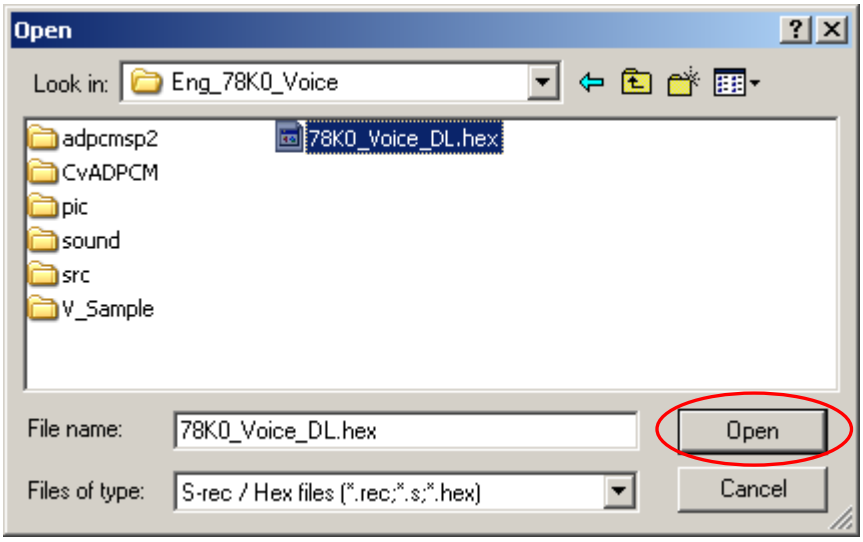


*The port pull-down menu only shows those active COM port numbers in the PC.

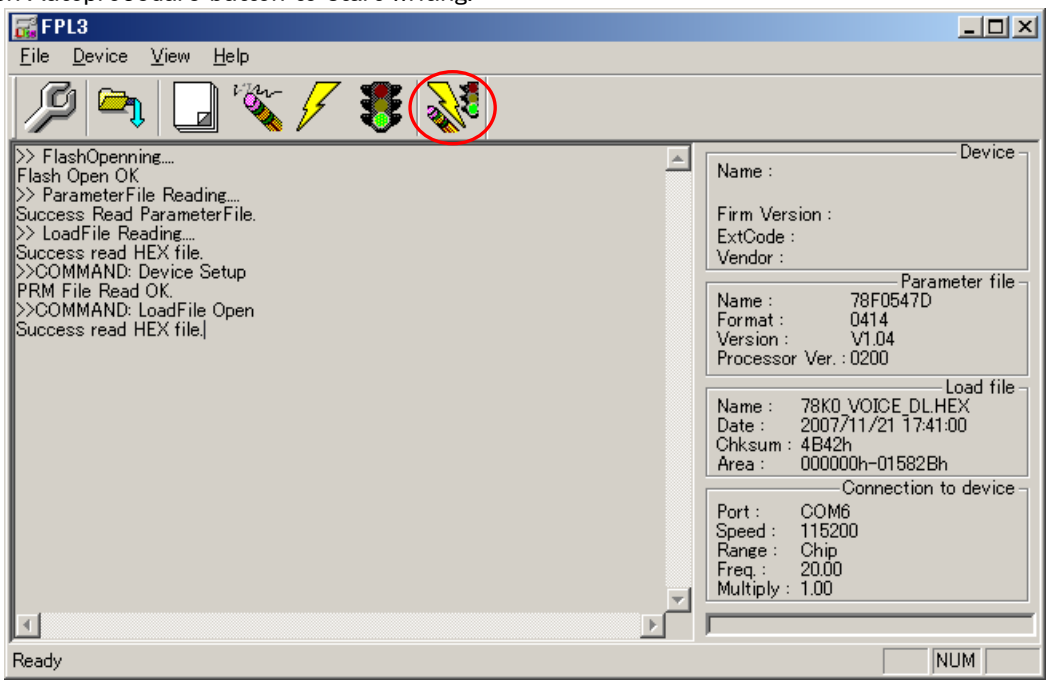
⑦ Click load button.



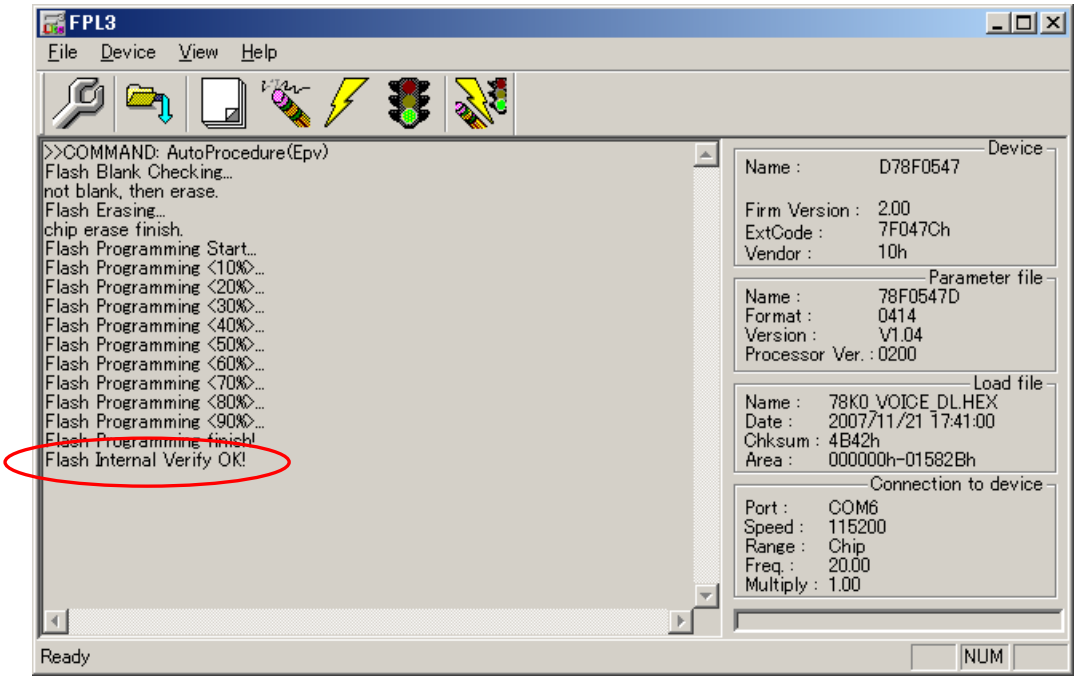
⑧ Open "TK78K0¥Eng_78K0_Voice¥78K0_Voice_DL.hex", then select the file to write.



⑨ Click Autoprocedure button to start writing.



⑩ When "Flash Internal Verify OK!" is displayed, it completes writing the program. Close PG-FPL3.



⑪ Set the switched as shown below, then press the reset switch (SW6). The written program runs.

Set 1 and 2 of DIPSW (SW1) to OFF, then press reset switch (SW6)

DIPSW(SW1)							
1	2	3	4	5	6	7	8
OFF	OFF	OFF	OFF	OFF	X	X	OFF

X:Don't Care

SW5 UART side

4.2.1 Run Sample Programs

The sample program has following functions.

1. Sound Play Function
   Play selected sound data from bundled 4 different sound data.
2. Sound Data Download Function (only Sample Program 2)
   Download/modify sound data by connecting with PC (CvADPCM Tool).

4.2.2 Sound Play Function

This sample application plays selected sound data from bundled 4 different sound data.
Also by switching SW4 to ON/OFF, you can check the filtering effects.

1. Switch operation

   ①SELECT Switch（SW2）
   Select a sound data number to play from 4 different sound data on the built-in flash memory.
   7segLED displays the sound data number (1→2→3→4→1・・・・).
   When the sound is playing, SELECT switch (SW2) cannot be used.

   ②PLAY/STOP Switch（SW3）
   This can play/stop the sound.
   When it is not playing the sound, you can start playing the sound by pressing the PLAY/STOP switch（SW3）down.
   When it is playing the sound, you can stop playing the sound by pressing the PLAY/STOP switch（SW3）down.

2. 7seg-LED display

   This displays the selected sound data number (1→2→3→4→1・・・・).
   The selected sound data number (1-4) blinks when it is playing the sound.

【NOTE】
Check the volume level before you start playing sound.
Start with the minimum volume level, and turn up the volume gradually to find the appropriate level.

When the USB power supply has noise, the output sound data will have noise as well.

4.2.3 Sound Data Download Function

This downloads/modifies 4 sound data that are used in the sound play application by the download function with PC (CvADPCM Tool). Only Sample Program 2 can use this function.
As the CvADPCM tool uses the USB port, the debugger (ID78K0-TK) cannot be used.

1. DIPSW(SW1), SW5 setting

Set DIPSW(SW1) bit8 to ON, then reset (SW6).

DIPSW(SW1)							
1	2	3	4	5	6	7	8
OFF	OFF	OFF	OFF	OFF	X	X	ON

X:Don't Care

SW5 UART side

2. Switch Operation

①SELECT Switch(SW2)

It selects the area to modify from sound data storage areas (4 areas).

7seg-LED shows which is selected.

While you are waiting for transferring and downloading data, SELECT switch (SW2) cannot be used.

②allowing download switch (SW3)

It starts the download. It waits the data to be transferred from PC after the operation.

It cannot be operated when downloading.

While you are waiting for transferring data, the dots of 7segLED blink.

* While you are waiting for transferring data, you cannot cancel it even though you press the allowing download switch (SW3).

3. 7seg-LED Display

This displays the selected writing area number (1→2→3→4→1・・・・).

When the status is to wait for transferring data, the dots blink (the selected writing area number remains)

When it starts downloading, the dots stop the blinking.

While it downloads the data, selected writing area number blinks (blinking speed is faster than the time of playing sound).

Caution

In this sample program, the sound data size is limited to 16000B in 1 data area (16KB).

4.2.3.1 Procedure to change sound data by downloading

In this section, how to change the sound data by downloading is explained.

1. Connection of devices
   Connect TK-78K0/KF2+Voice USB1 connector and PC with USB cable.
   7segLED displays "1".

2. Preparation of the application
   Select the writing area by operating the SELECT switch (SW2), and then press down the allowing download switch (SW3).
   The writing area number is displayed at 7segLED.
   After pressing the allowing download switch, the dots of 7segLED start blinking (waiting for transferring data).

   *After pressing the allowing download switch (SW3), it deletes the data in the selected writing area. If an error occurs, the 7segLED displays the letter "E". In this case, reset it and start the process from above "2 Preparation of the application" again.

3. Download sound data
   Start downloading by selecting the sound data with CvADPCM tool.
   Caution: Following compression format could be used.
   "ADPCM SP2 -4bit/Sample"
   "ADPCM SP2 -2bit/Sample"
   For operation of CvADPCM tool, refer to "Audio Data Conversion Tool (CvADPCM) User's Manual".
   You can find sample WAVE data in following directory.
   TK78K0¥Eng_78K0_Voice¥V_Sample¥

4. Start download
   While it is downloading, 7seg-LED is blinked alternately.
   Blinks of dots that shows the status of waiting for transferring data are turned off.
   When the blinks of 7seg LED are turned off and the light is turned on, it means that the download is completed.
   If you wish to continue downloading, repeat the steps from 2.

   *If an error occurs, the 7segLED displays the letter "E". In this case, reset it and start the process from above "2 Preparation of the application" again.

5. Play downloaded sound data
   Set DIPSW(SW1) bit8 to **OFF** and reset (push reset switch)
   Select the sound data by operating the SELECT switch (SW2), and then press down the PLAY/STOP switch (SW3). The sound starts playing.

CHAPTER 5 Troubleshooting

This chapter describes how to solve troubles you may face.

5.1 If you cannot find USB driver when you connect PC to the kit

Check Point 1

If you use USB hub, do not use it. (USB hub is not supported)

Check Point 2

If you use a USB port that is different from the USB port you used before, refer to "1.3 Installation of USB Driver" to install the USB driver.

Check Point 3

If above 2 check points are confirmed, disconnect the USB cable from PC and re-connect again.

5.2 Error when you start the debugger

There could be several reasons to make errors happen.
The solving processes differ depending on errors. Please check the error message first.
The solving processes for each error are as follows.

5.2.1 "Can not communicate with Emulator..." (F01b0)

Check Point 1

If you use USB hub, do not use it. (USB hub is not supported)

Check Point 2

Check if the settings of switch on the kit are correct with referring "3.3.1 SW1, SW5".

Check Point 3

Confirm the USB driver installation with referring to "1.3.3 Completion of USB Driver Installation". And check if the COM port number assigned to the board and the COM port number set at "Portconfig for ID78K0-TK" is the same.

Check Point 4

If above 3 check points are confirmed, close the debugger and disconnect the USB cable from PC. Re-connect USB cable properly to both the PC and the kit, and then re-start the debugger.

5.2.2 「No response form the CPU ・・・」(A01a0) or no response from ID78K0-TK.

Check Point 1

If you use USB hub, do not use it. (USB hub is not supported)

Check Point 2

Check if the settings of switch on the kit are correct with referring "3.3.1 SW1, SW5".

Check Point 3

Confirm the USB driver installation with referring to "1.3.3 Completion of USB Driver Installation". And check if the COM port number assigned to the board and the COM port number set at "Portconfig for ID78K0-TK" is the same.

Check Point 4

If above 3 check points are confirmed, close the debugger and disconnect the USB cable from PC. Re-connect USB cable properly to both the PC and the kit, and then re-start the debugger.

5.2.3 "Incorrect ID Code." (Ff603)

This error occurs when the security ID stored on microcontroller built-in flash memory is different from the ID code you entered at the start of debugger.

Security ID entry area at the start of debugger

Check Point 1

Enter correct security ID and click OK on the configuration window.

Check Point 2

If you forgot the security ID, you have to erase the microcontroller built-in flash memory. Before erasing, check if you actually set the security ID with referring to "2.4 Set Linker Options". Also remember the code you set for the security ID.
After this, erase the flash memory with referring to "6.3.8 Erase microcontroller built-in flash memory".

5.2.4 "The on-chip debug function had been disabled in the device." (F0c79)

Check Point 1

Check if you actually set the correct on-chip debug option byte with referring to "2.4 Set Linker Options". If it is not correct, then set correctly.

5.2.5 When the flash memory erasing is not well with PG-FPL3.

Check Point 1

Check if the "Frequency" is set to 20MHz.

Check Point 2

Check if the "Parameter file" is set to "78F0547D.prm".

Check Point 3

Check if the COM port number the same as the COM port number assigned to the board.

Check Point 4

Check the switch settings on the board are correct.

CHAPTER 6　Other Information

This chapter explains some useful operation techniques of development tools and circuit diagram of the kit for developing of user programs.

6.1 Create a new workspace (project)

6.2 Register additional source file

6.3 Debugger tips

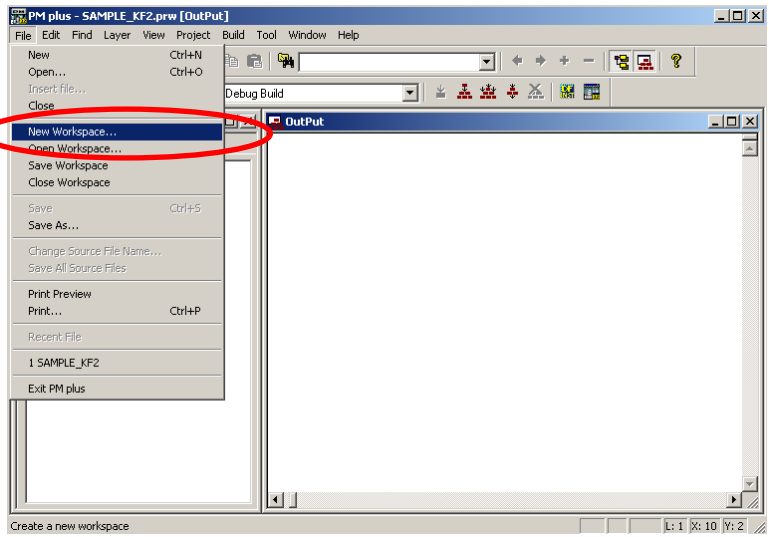
6.4 Circuit diagram

6.1 Create a new workspace

Now, create a new workspace and project.

PM Plus allows you to create a new workspace with following "New WorkSpace" dialog.

Please select [File]→[New Workspace...] in the pull-down menu of the PM plus.



The dialog box for creating New workspace is displayed

<Description of items>

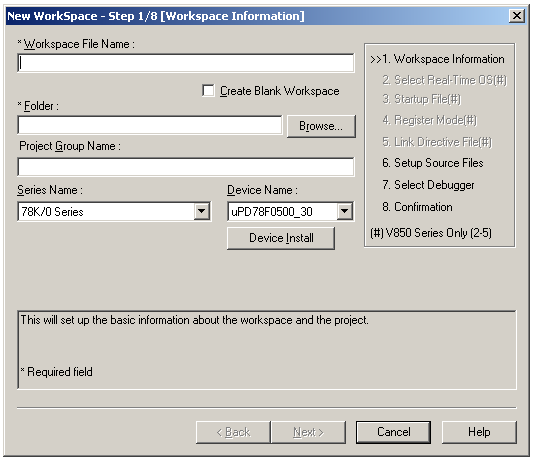
Workspace File Name:
-> Specify the name of the workspace file that manages the project files.
.prw is automatically suffixed as the file type.
A project file (.prj) of the same name is simultaneously created.

Folder:
-> Specify the folder for saving the workspace file by writing its absolute path.
This item can be selected from a reference dialog box by pressing the Browse... button.

Project Group Name:
-> Specify this item if wishing to manage multiple projects together in function units.
If nothing is specified, this item is the same as the workspace file name.

Series Name:
-> Specify the series name of the device to be used.

Device Name:
-> Specify the name of the device to be used.



The concrete information set here is described on the following pages

Input the workspace information setting as follows.

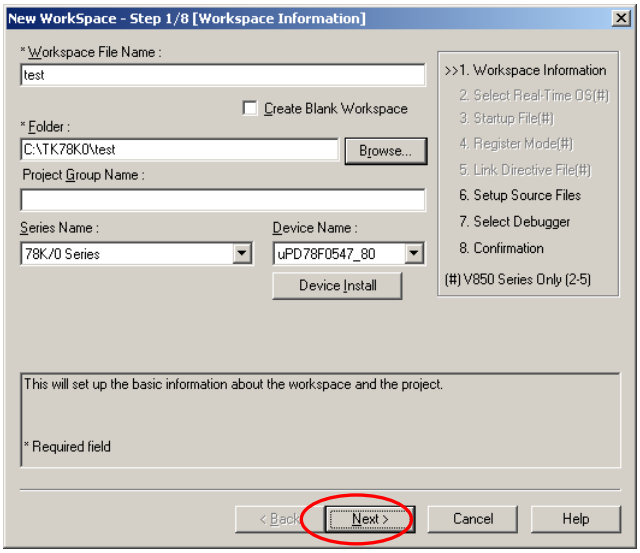
Workspace file name
→ test

Folder
C:¥TK78K0¥test

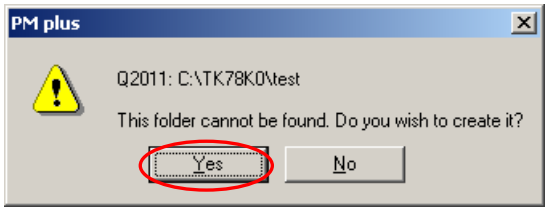
Project Group Name
→ Don't input this item.

Series Name
→ 78K/0 Series

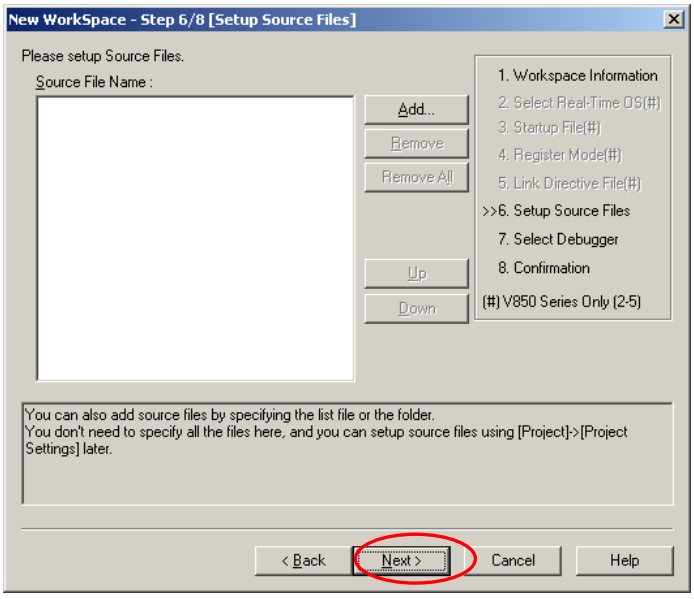
Device Name
→ uPD78F0547_80



Push the Next > button.

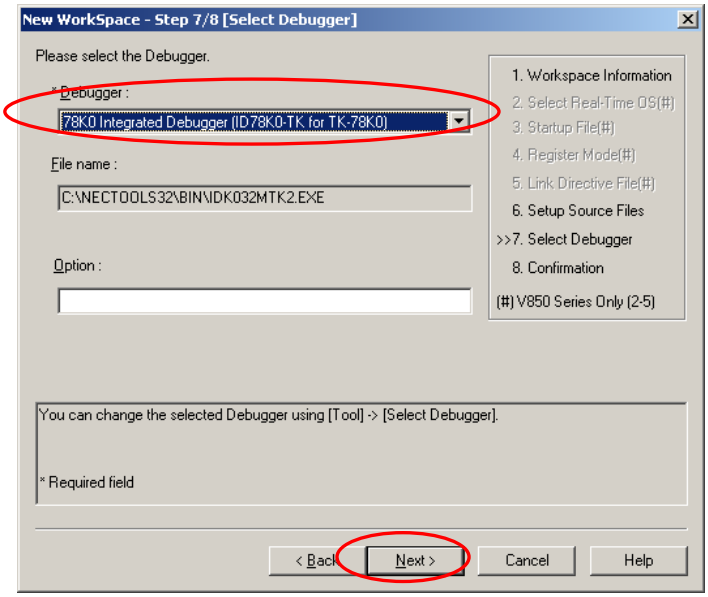


Push the Yes button.

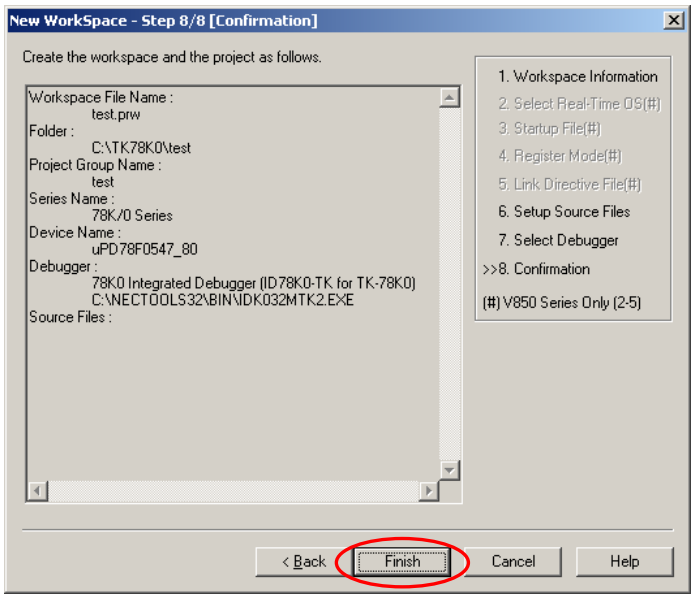


Push the Next > button.

Please select 78K0 Integrated Debugger (ID78K0-TK for TK-78K0)

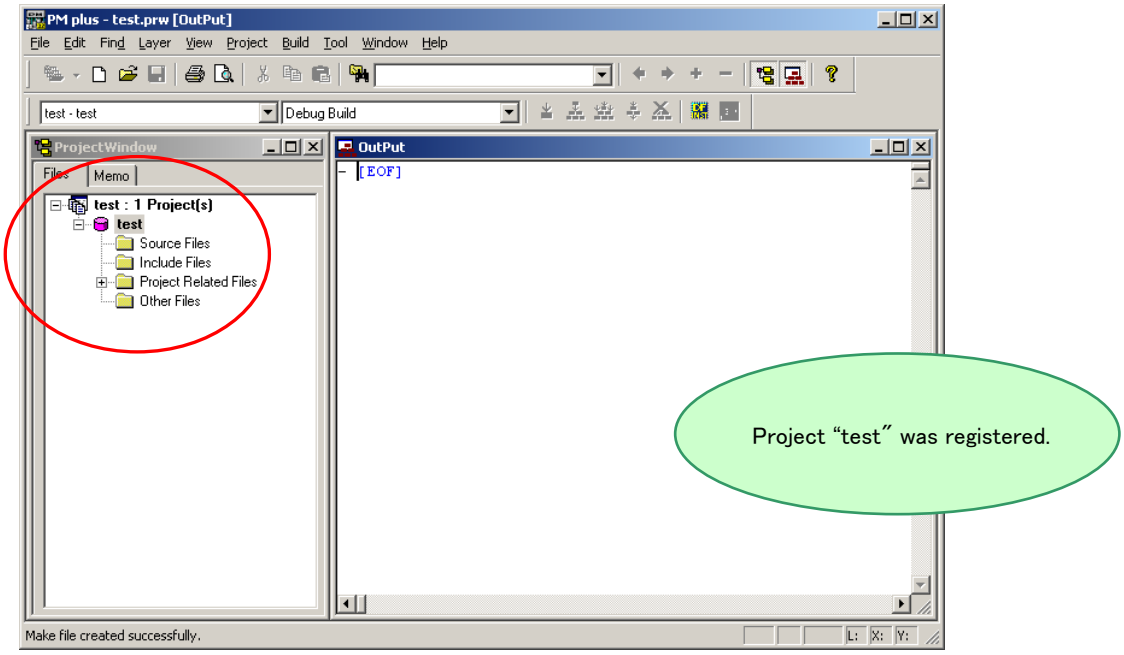


Push the Next > button.



Push the Finish button.

Check the project information setting contents.



This completes workspace and project creation.

Additional source files can be registered at any time thereafter.

For details, refer to "6.2 Registering additional source file"

Next, add the following "option_byte.asm" file, and configure the option byte settings and the authentication settings for security ID. For details about option byte, refer to the device user's manual. For details about security ID, refer to "ID78K0-QB Operating Precautions".
The option byte setting file is included in the demonstration program. Copy this file and use. For adding files, refer to "6.2 Register additional source file".

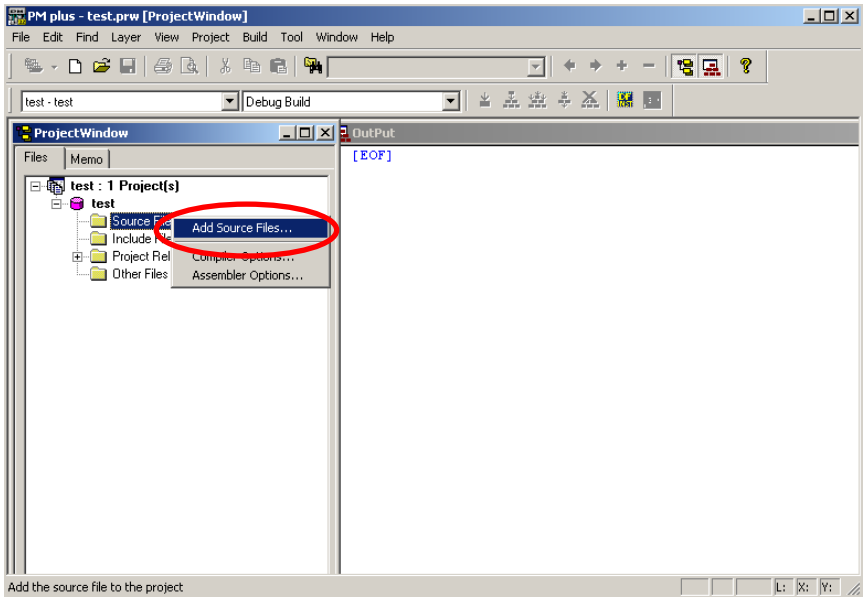
```
ORG 80H     : Option Bytes setting
DB 0,0,0,0;

ORG 84H
DB 2     : on-chip debug security enable

end
```

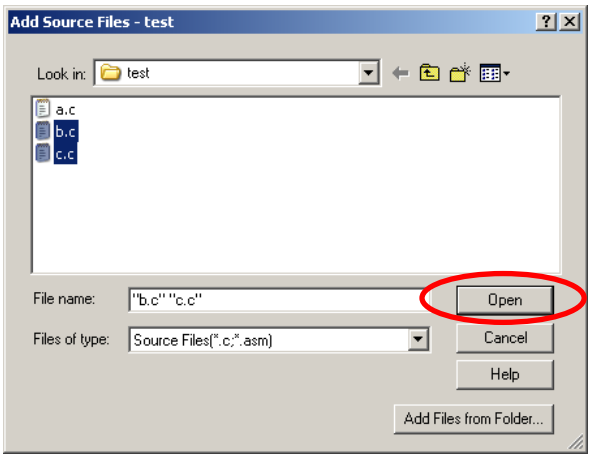
option_byte.asm

Also, you need to do the settings for on-chip debug. Please refer to "2.4 Set Linker Options", "2.5 Set Compiler Options", and "2.7 Check Debugger Settings".

6.2 Register additional source file

Now, register additional source files.
The following example shows the additional registration of source files "b.c" and "c.c" with source file "a.c" already registered.
Place the cursor on the source file in the Project window of PM Plus, and select [Add Source Files…] displayed in the right-click menu.

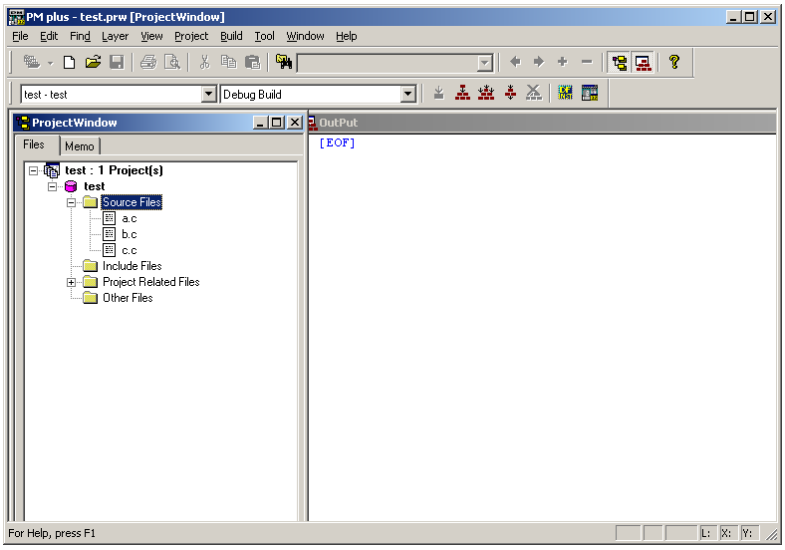




Select source files "b.c" and "c.c", then click Open

Multiple source files can be selected by clicking them with pressing Ctrl key.

Source file "b.c" and "c.c" are additionally registered to the project.

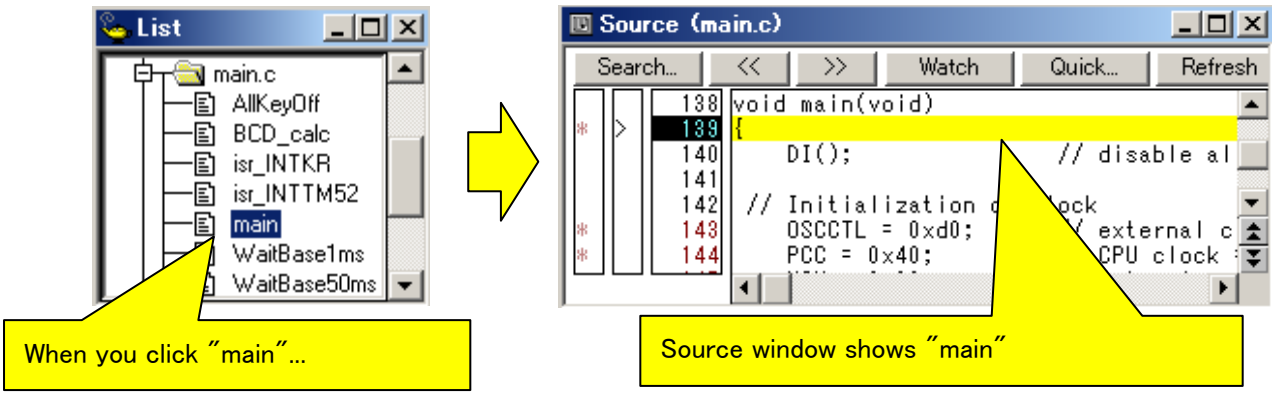


6.3 Debugger tips

This section describes some useful techniques for the debugger (ID78K0-TK).

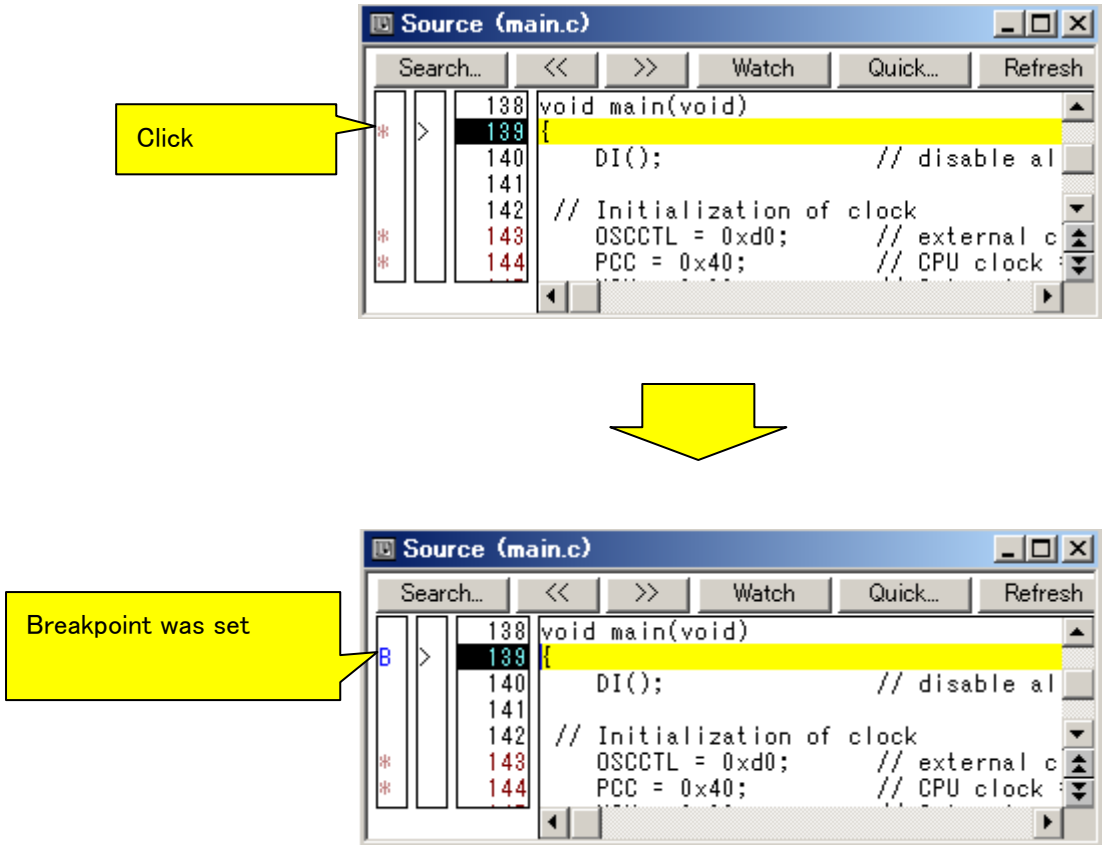
6.3.1 Display source list and function list

When you wish to see source file list or function list, select "Browse" on menu bar, then "Other" -> "List" to open the list window. The information in the windows is synchronized. Therefore, it is not just for referring to the list, but it is useful when you wish to update files or functions.



6.3.2 Set/delete breakpoints

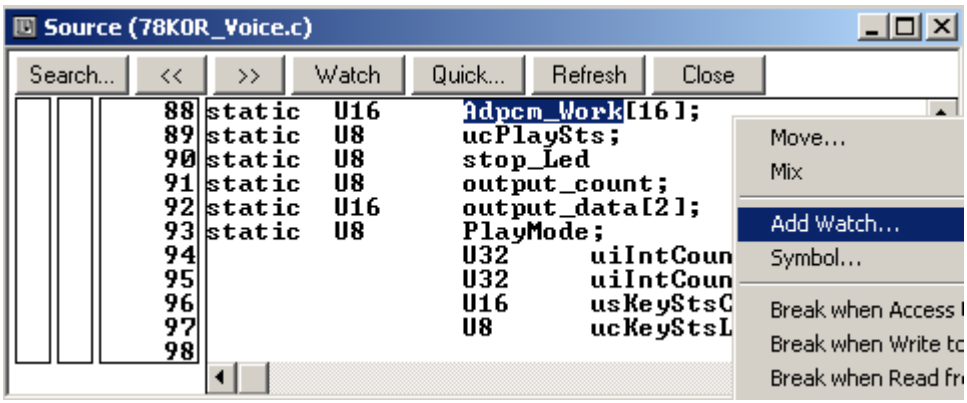
Breakpoints are executed by clicking lines in which " * " is displayed
"B" is displayed in the line where a breakpoint is set.
Breakpoints are deleted by clicking "B".



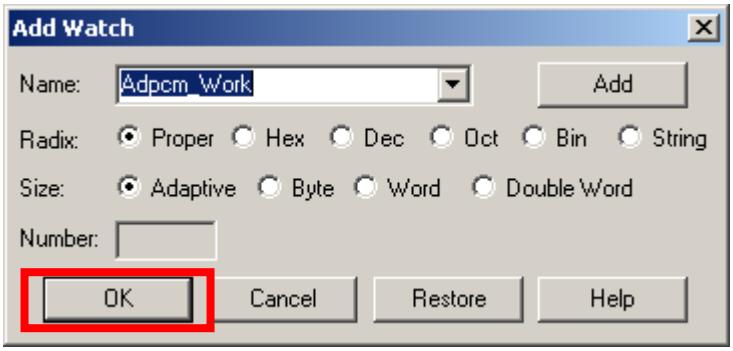
6.3.3 Display global variables

With using Watch Window, you can display global variables. There are several ways to register global variables to watch window. In this section, how to register from source window is described.

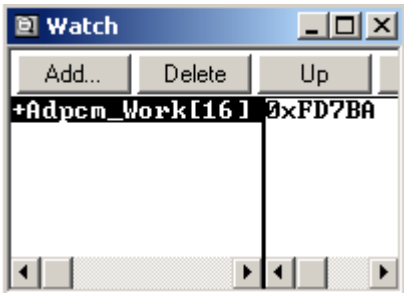
①Right-click the variable on source window, then select "Add Watch..."



②Add Watch dialog opens. Click OK .

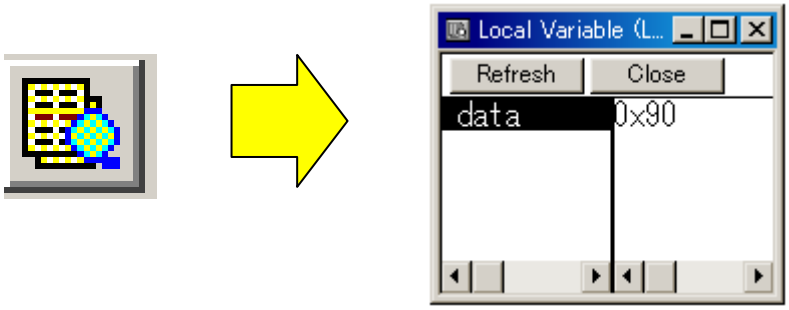


③Adding a variable to watch window is completed.



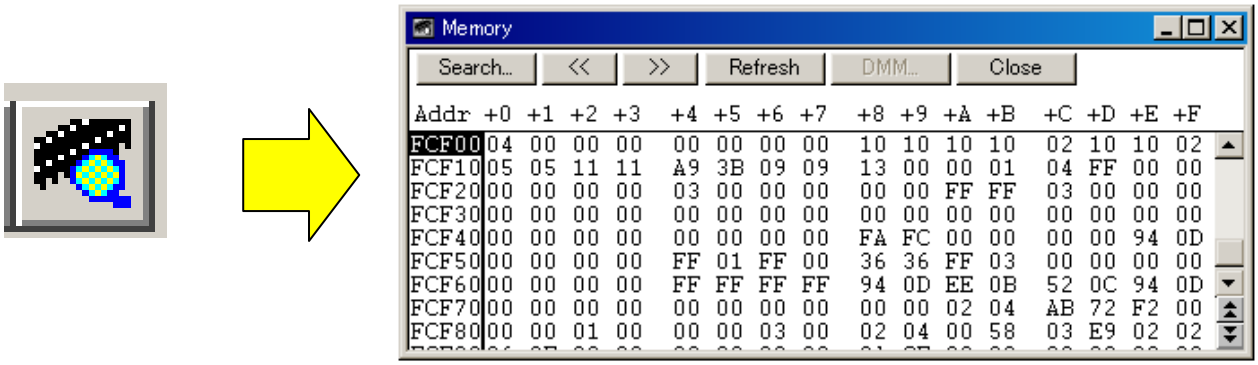
6.3.4 Display local variables

Local variable window is used to display local variables.
By clicking the button below, you can open the local variable window.
Unlike global variables, local variables cannot be displayed when programs are running.

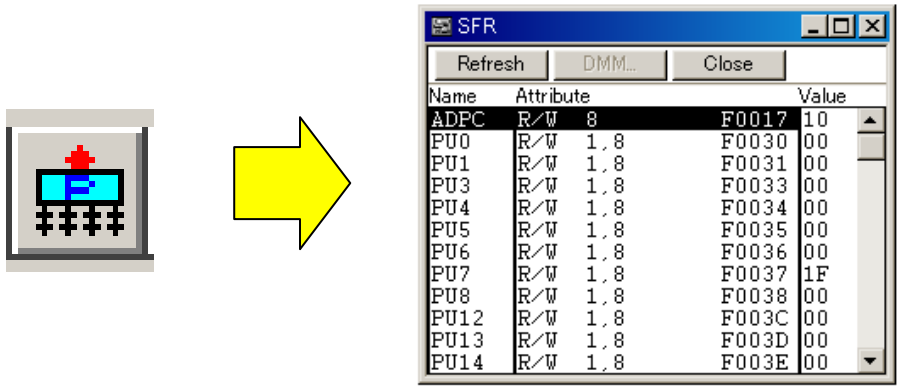


6.3.5 Display memory and SFR contents

By clicking the button below, you can open the memory window.



By clicking the button below, you can open the SFR window.



6.3.6 Erase microcontroller built-in flash memory

If you forgot the security ID or if you set On-Chip Debug Option Byte to disable the on-chip debug function, you cannot start debugger. In this case, you need to delete the setting values of security ID and On-Chip Debug Option Byte. Use PG-FPL3 to erase the flash memory.

The hardware for PG-FPL3 is incorporated in TK-78K0.

Installation of PG-FPL3

Run "¥FPL3¥FPL3_V110¥Setup.exe" on bundled CD-ROM from Windows Explorer. The installation starts.

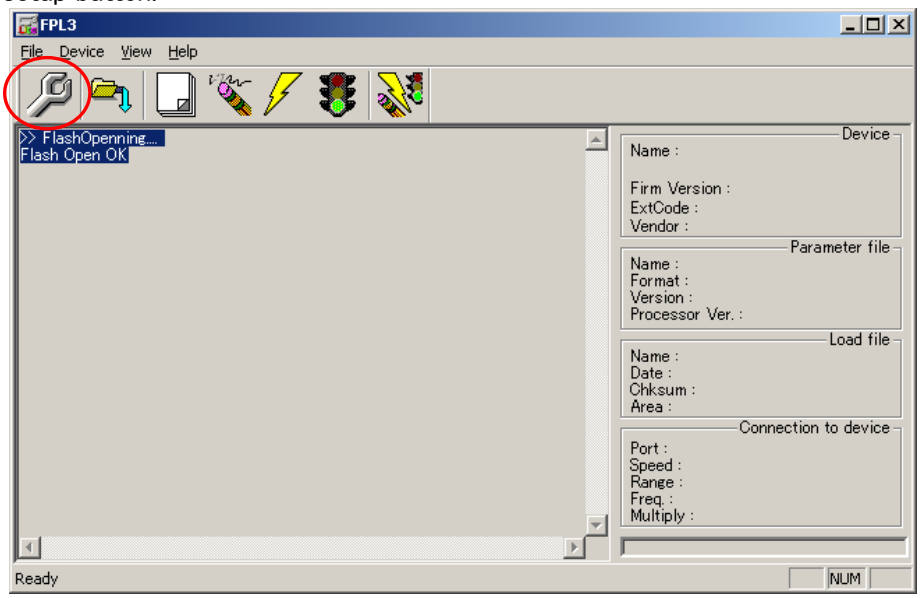
PG-FPL3 cannot be installed by the integrated installer.

① Set the switches as shown below and connect the PC.

JP1		1-2 Short (USB side)
SW5		UARTside
SW1	Bit1	ON
	Bit2	ON
	Bit3	OFF
	Bit4	OFF
	Bit5	OFF
	Bit6	OFF
	Bit7	OFF
	Bit8	OFF

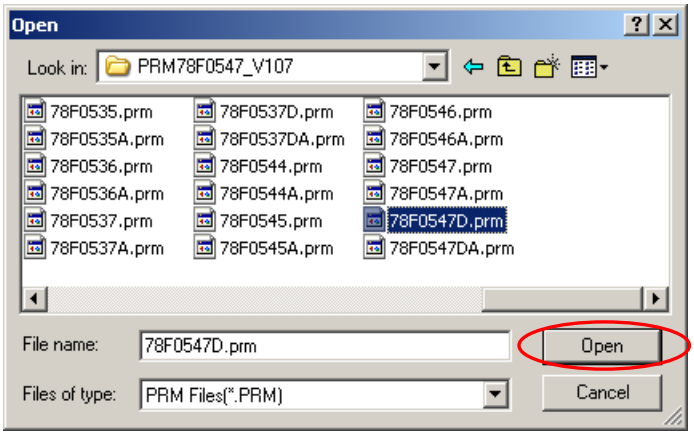
② Select "Windows Start" menu, "Programs", "NEC Tools32", then "PG-FPL3" to start PG-FPL3

③ Click the setup button.

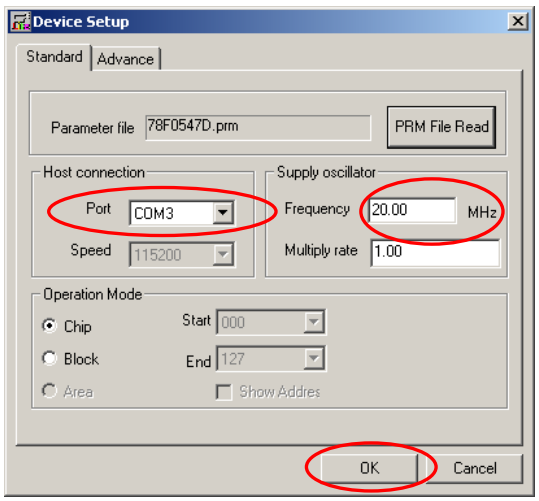


④ Click "PRM File Read" button.

⑤ Select "¥PRM¥PRM78F0547_V107¥78F0547D.prm" in the bundled CD-ROM.

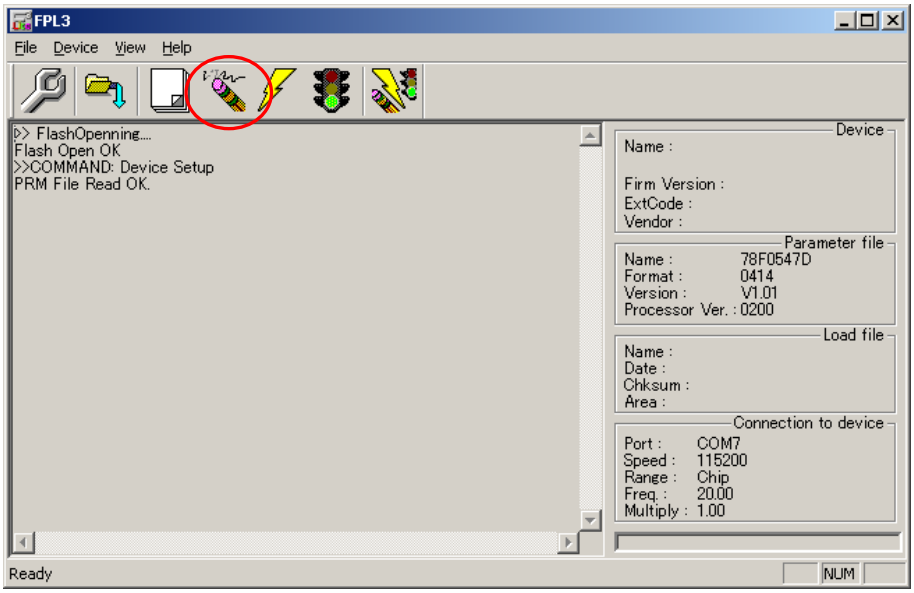


⑥Select the COM port number that TK-78K0 is assigned. Enter "20.00" in the "Frequency" field. Click "OK" button.

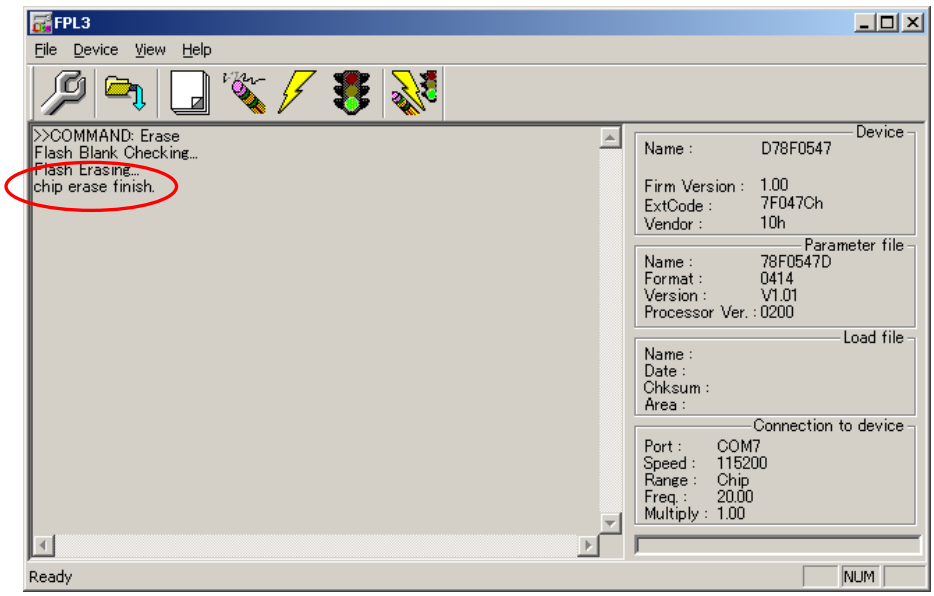


*The port pull-down menu only shows those active COM port numbers in the PC.

⑦ Click "Erase" button. It starts erasing the flash memory.



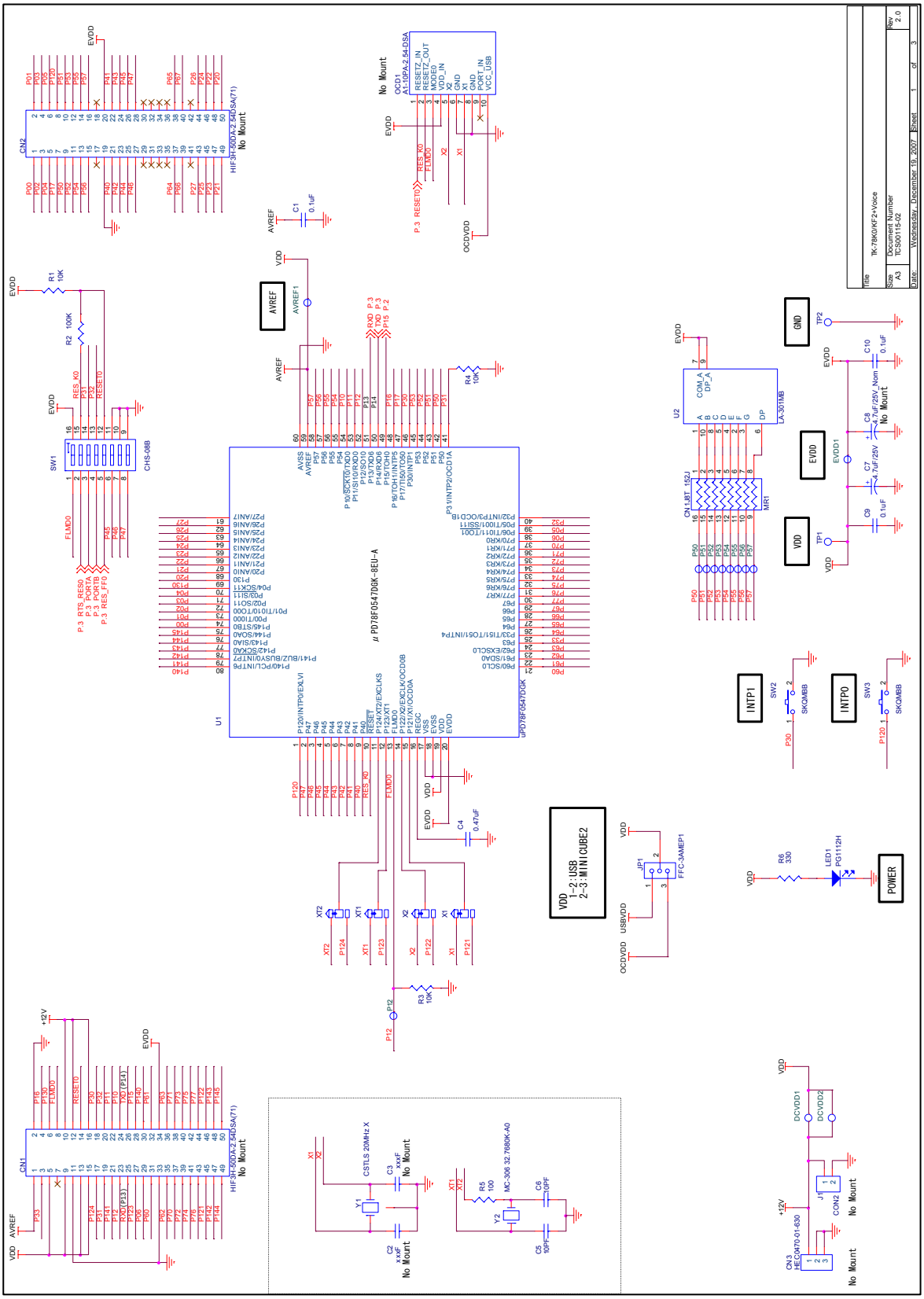
⑧ Erasing the flash memory is completed when "chip erase finish" is displayed.
Close PG-FPL3.

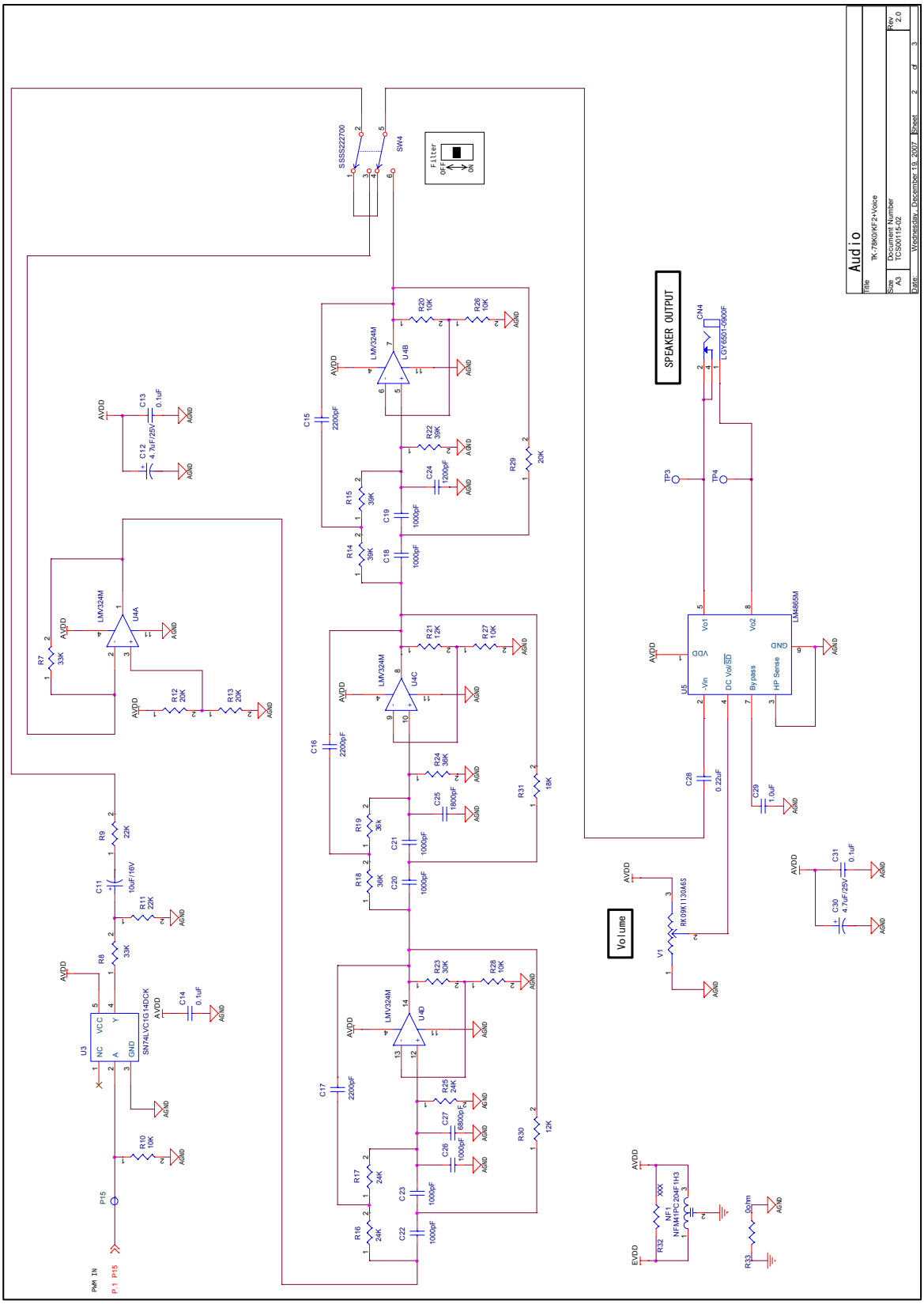


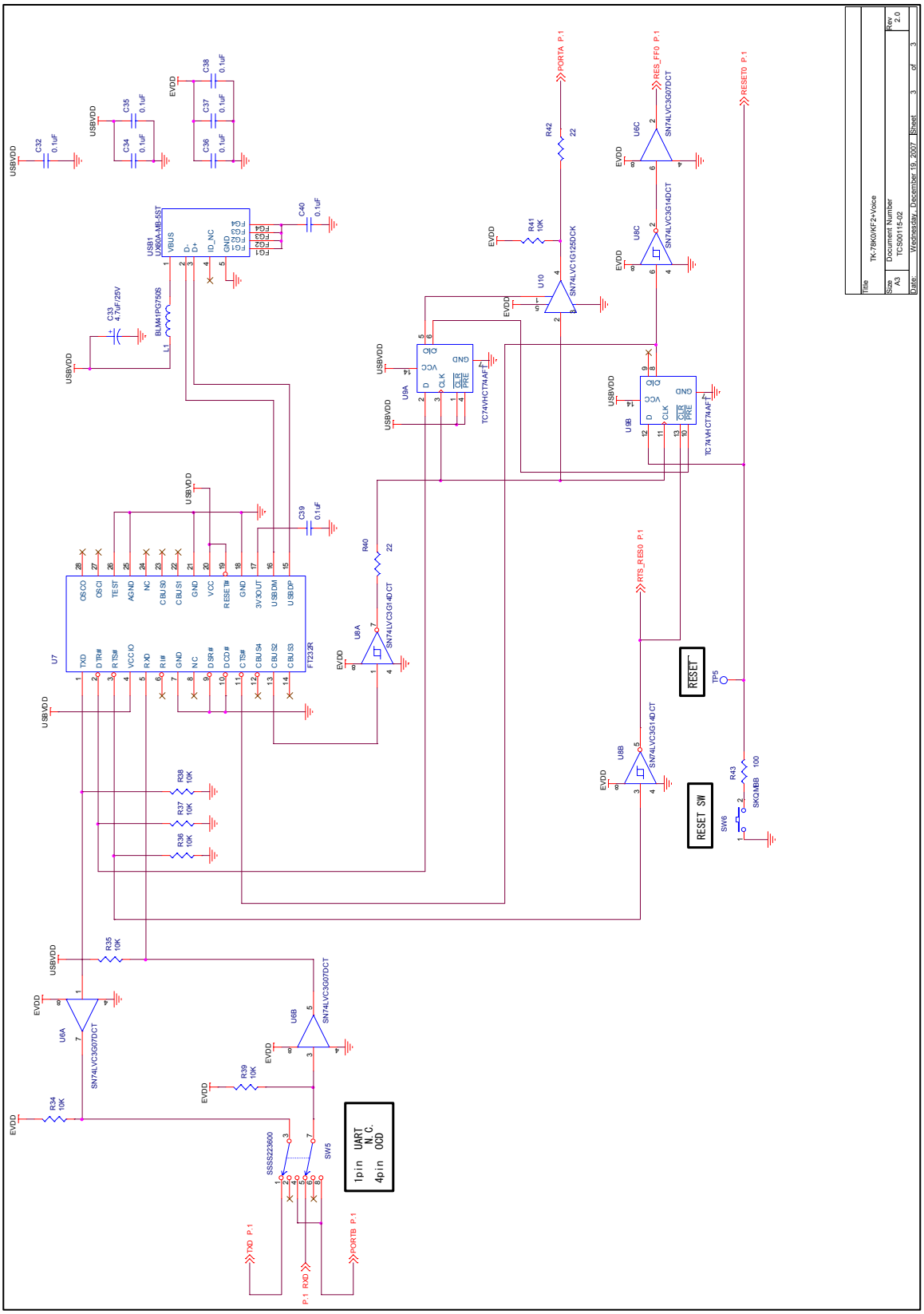
⑨Put the switch settings back to original settings.

6.4 Circuit diagram

From following page, it shows the circuit diagram of the demonstration kit.




Audio
TK-78K0/KF2+Voice
SPEAKER OUTPUT
Volume
PWM IN
P15
P1.1 P15
SW4
SSSS222700
Filter
OFF
ON
LMV324M
U4A
U4B
U4C
U4D
LM4865M
SN74LVC1G14DCK
RK09K1130A6S
LGY6650106900F
NFM41PC204F1H3
AVDD
AGND
EVDD


RESET
RESET SW
1pin UART N.C.
4pin OCD
TK-78K0/KF2+Voice
TC50D0115-02
Wednesday, December 19, 2007